OCTOBER 1953

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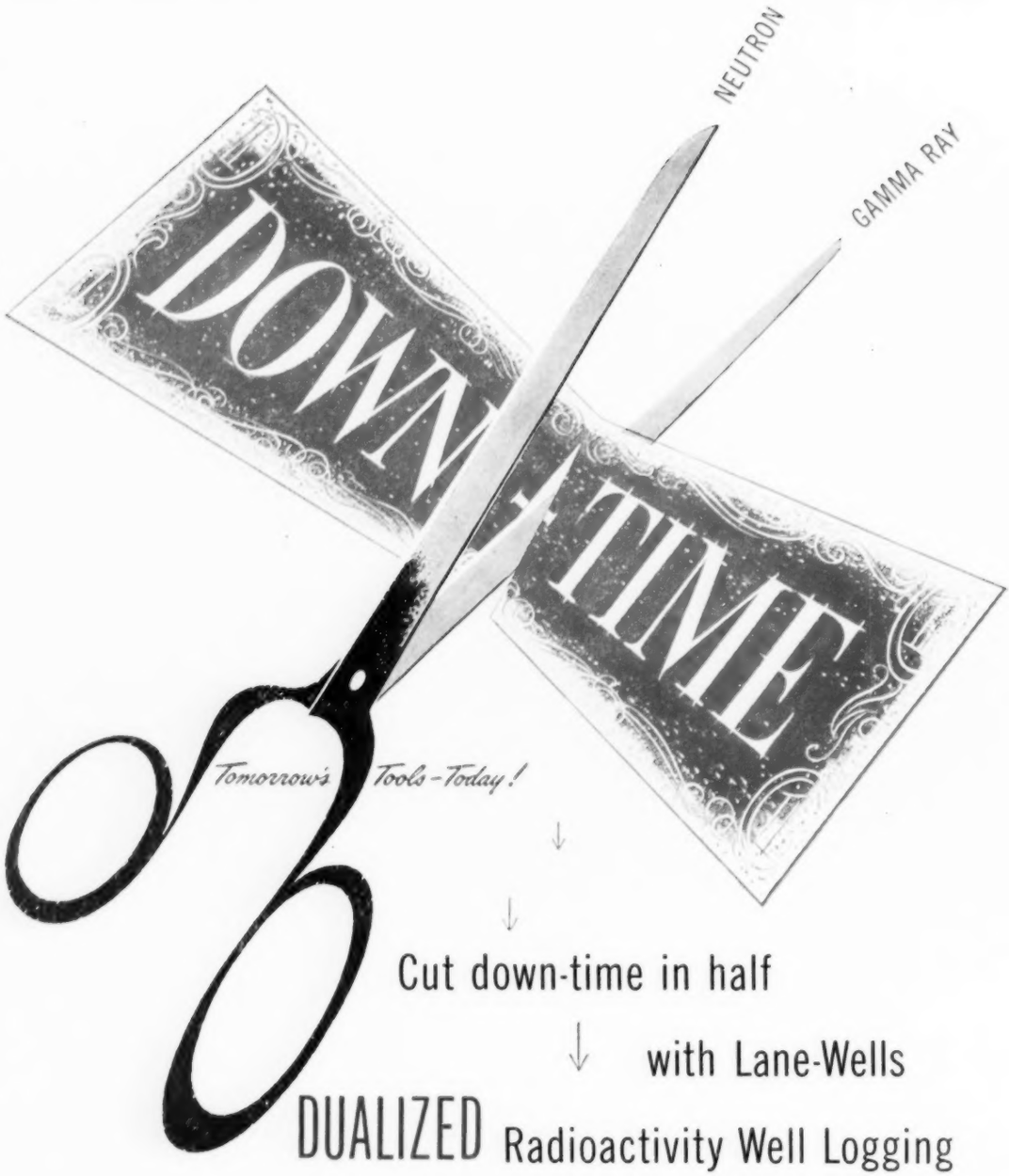

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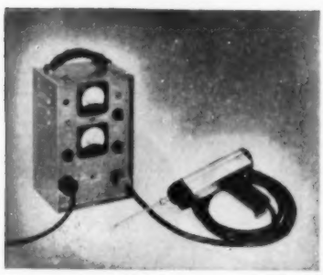

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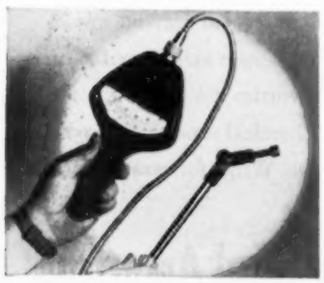

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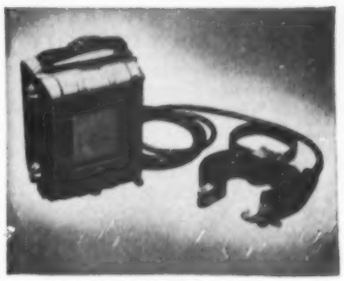

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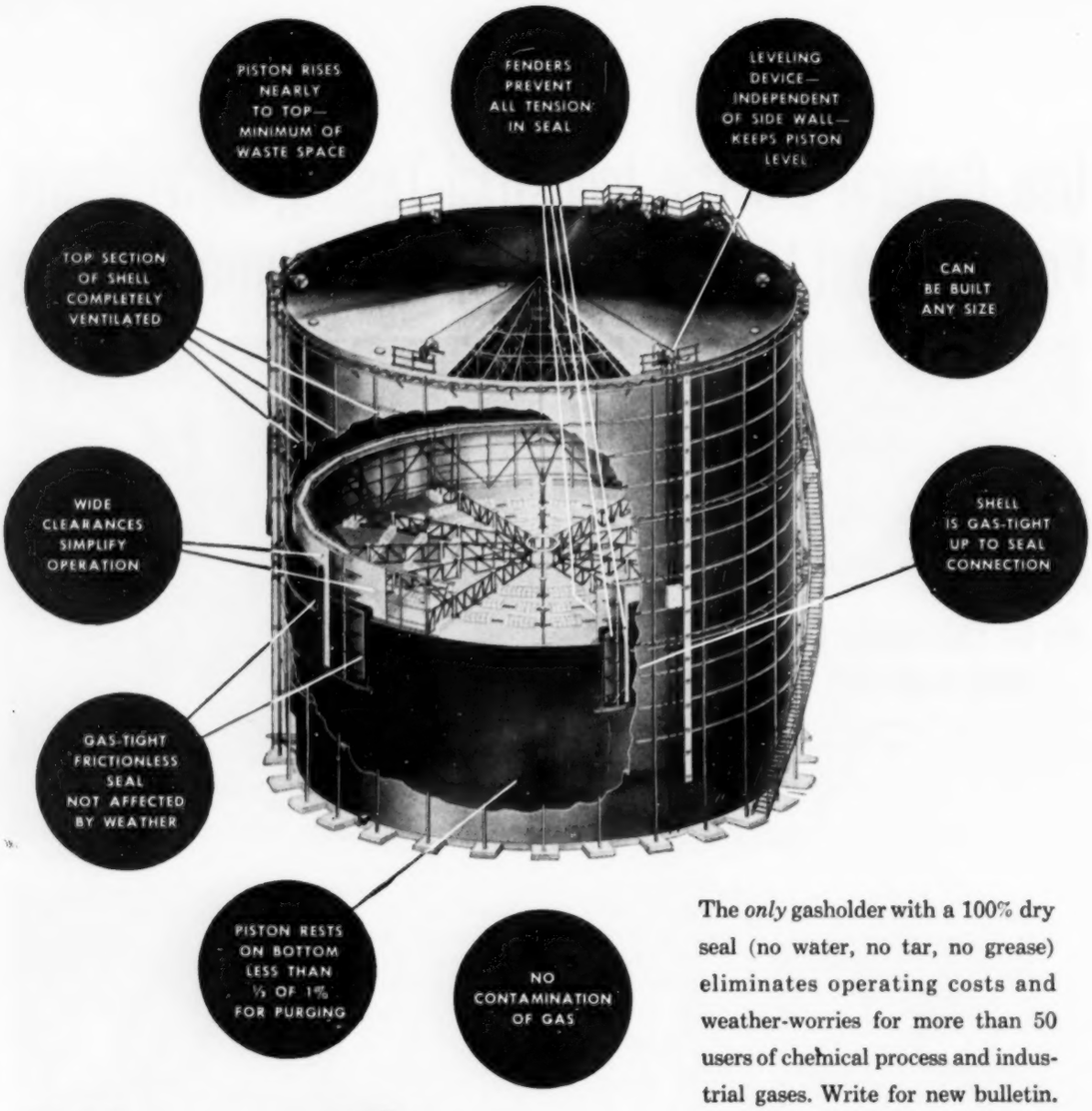
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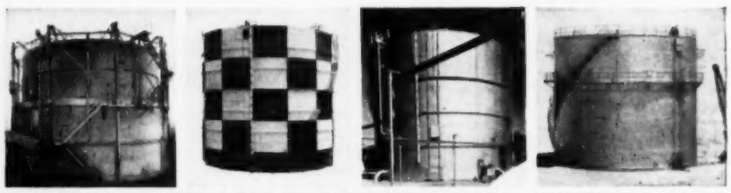

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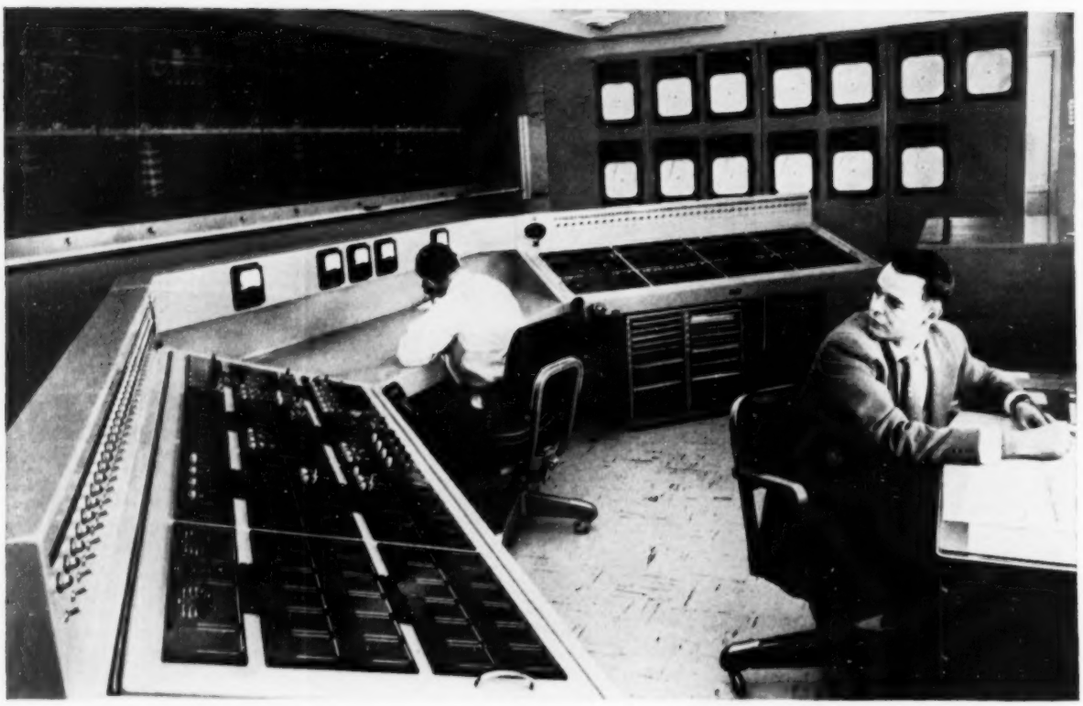

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Washington PIPE LINE

By Joseph B. Huttlinger

FPC Ruling Brings Clash with Canada

Federal Power Commission's first move toward solving the question of interchange of natural gas between Canada and the United States has had a sour reception in the Dominion. On Aug. 27, the Commission approved the application of Tennessee Gas Transmission Co. to sell 22.6 billion cubic feet of gas yearly to Niagara Gas Transmission Ltd. for distribution to the Ontario market centering about Toronto. This immediately brought sharp criticism from advocates of the projected Canadian transcontinental line who declared that if the richest part of the Canadian market was to be taken away, it would imperil the profitable operation of that system. Spurred to action by the FPC decision, the Minerals Commission of Alberta on Sept. 11 approved the application of Trans Canada Pipe Lines for gas from Alberta fields to supply its requirements. There is the making of an unpleasant controversy in this situation. Apparently what is needed is a meeting of minds between United States and Canadian officials on this whole question of moving gas across the border. Latest FPC action, September 22, denied Trans Canada's request for a rehearing on the order authorizing export of U. S. gas to Canada.

Benson To Visit Oil Fields

Secretary of the Interior Douglas McKay, the government's top man on petroleum and natural gas matters, is due for his first on-the-spot look at parts of the industry early in October.

Along with Joseph A. LaFortune, deputy director of the Petroleum Administration for Defense, Arthur Kuhl, PAD's information director, Clarence Davis, Interior's solicitor, Felix Wormser and Orme Lewis, assistant secretaries of the department, the Secretary is scheduled for a three-day airplane tour of oil fields in parts of Texas and Louisiana and of offshore oil operations.

The long hauls to and from Washington are to be made by commercial airliners, but aircraft of the Warren and Continental companies are set aside for shuttle travel in the oil areas.

An activity completely aside from the official trip is to be a speech by the Secretary at a $100-a-plate Republican rally at Houston being arranged by Jack Porter of Houston, Texas Republican national committeeman.

Hoover Named Oil Adviser

For the first time in a decade, the State Department has an official oil adviser. He is Herbert Hoover, Jr., son of the former President, a widely known engineer and formerly head of United Geophysical Co. He is designated as special assistant to Secretary John Foster Dulles.

Mr. Hoover has had first hand experience of the oil industry in many lands and the role of adviser to governments is nothing new to him. He has served in that capacity to half a dozen nations, including Venezuela, Chile, Peru and, among others, Iran.

New Top for 1954 Oil Spending

A new government estimate is that the American petroleum industry will spend nearly $2,824 million during the calendar year 1953 for plants to turn out petroleum products. The Securities and Exchange Commission says this is more than three times the 1945 spending and well above 1952's $2,597 million and 1951's $2,102 million. The SEC breaks down the 1953 plans by quarters as follows: first quarter $552 million; second, $724; third, $785; and fourth, $763 million. At the same time, the military will scale down its buying of total products by 10 to 15 percent, although official announcement is yet to come. Exact figures are hard to come by, but the military was buying about 600,000 barrels daily at the peak of Korean war.

Foreign Operations Bumps 350

Cornelius J. Dwyer, chief of the petroleum branch of the Foreign Operations Administration, is one of the few in key positions in the agency to survive the latest wave of economy lay offs.

A total of 350 persons were dismissed effective October 1, including 10 of the 12 branch chiefs, by order of Harold Stassen, Administrator of the $5 billion a year foreign aid agency.

Mr. Dwyer, the fourth head of the petroleum branch of the agency, has been warmly praised by Administrator Stassen for his work. Petroleum is regarded as the most important single commodity under the agency.

Walter Levy was the first head of the petroleum branch. Dr. Oscar Bransky followed. Then came Harvey Daniels.

Mr. Dwyer, a former newspaperman who is under age 40, was a glider pilot during the late war. After the end of hostilities he joined the foreign service of the State Department and served in London as petroleum officer. He switched over to the foreign aid program in 1949 during talks with British and Dutch officials about refining expansion and became head of the branch at the start of 1952. Mr. Dwyer also had a major hand in preparing the William S. Paley report to President Truman last year recommending more imports of petroleum and maintenance of the depletion allowance for U. S. oil producers.

May Ask U.S. to Build Plants

The Petroleum Administration for Defense, which seeks an additional 20,000 barrels daily of alkylate capacity for production of aviation gasoline, may recommend that the government build the plants if industry does not. Early November has been set as the deadline for the decision; in the meantime, PAD is talking it over with some 20 oil companies which it believes are in a position to add to capacity. The nub of the matter is that industry, in general, sees no normal use for more alkylation capacity, but PAD wants a spare capacity against the demands of war. The Armed Services Petroleum Purchasing Agency has $82 million to finance part of the cost of construction, but cost of operation would be up to industry.

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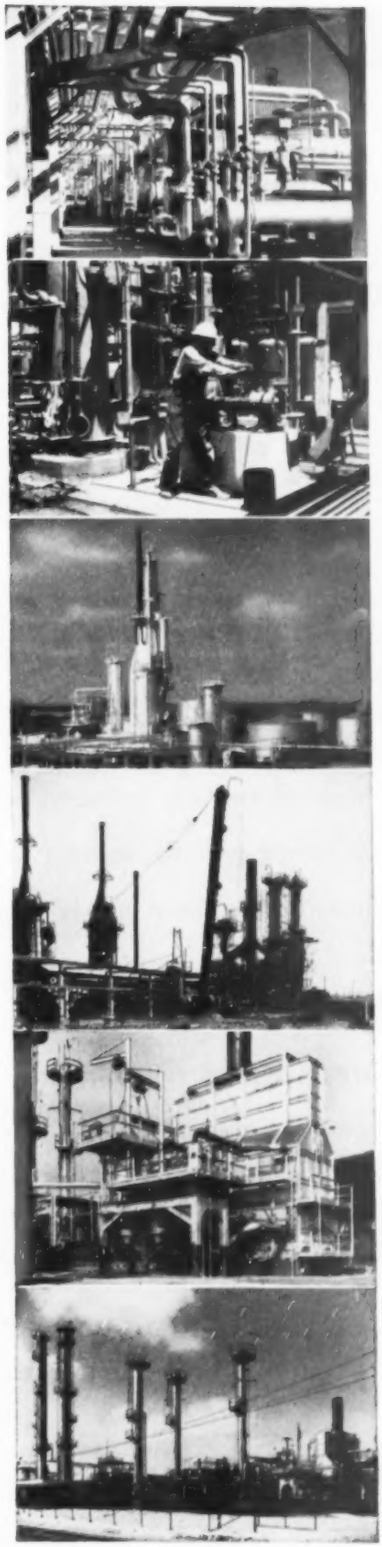

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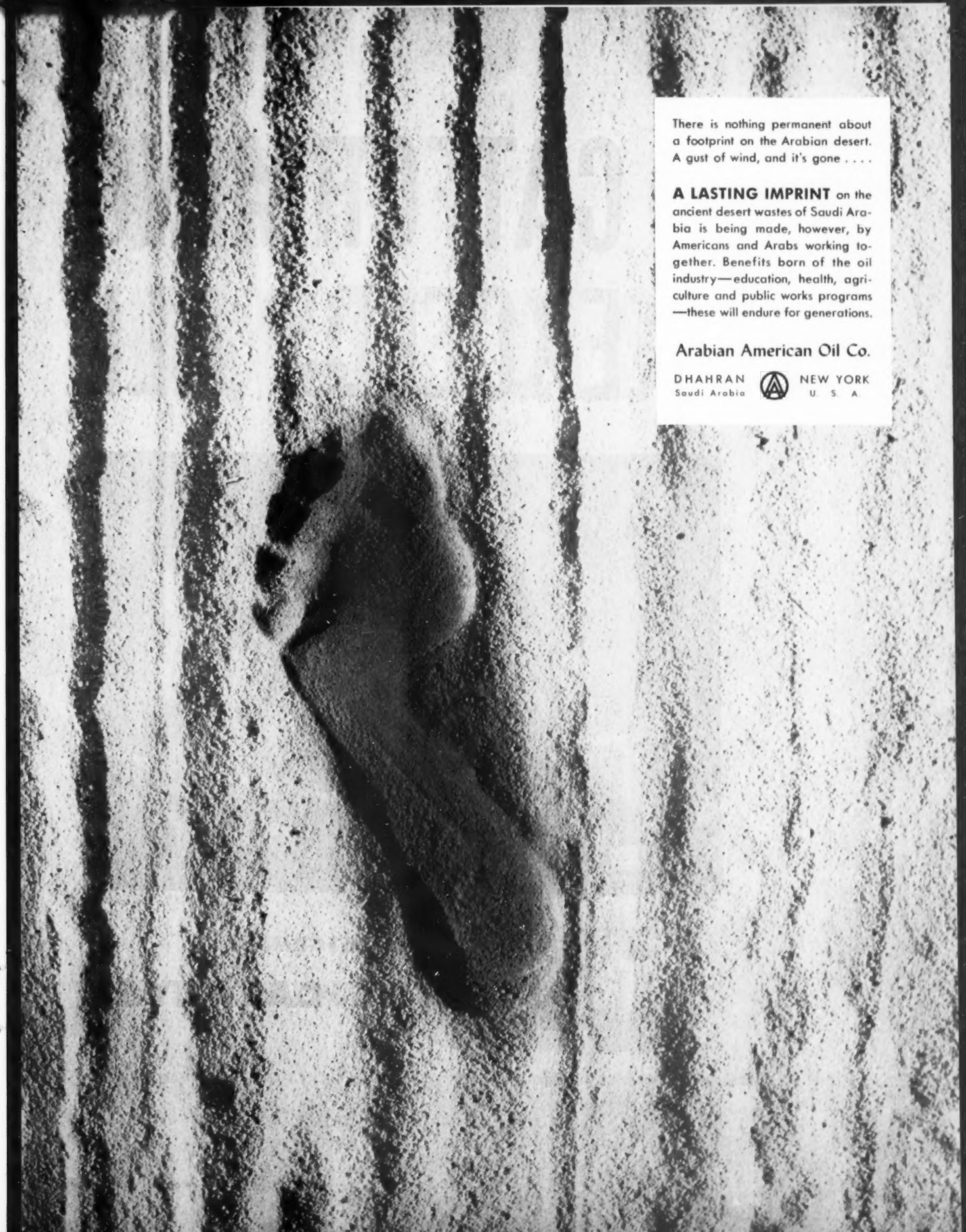

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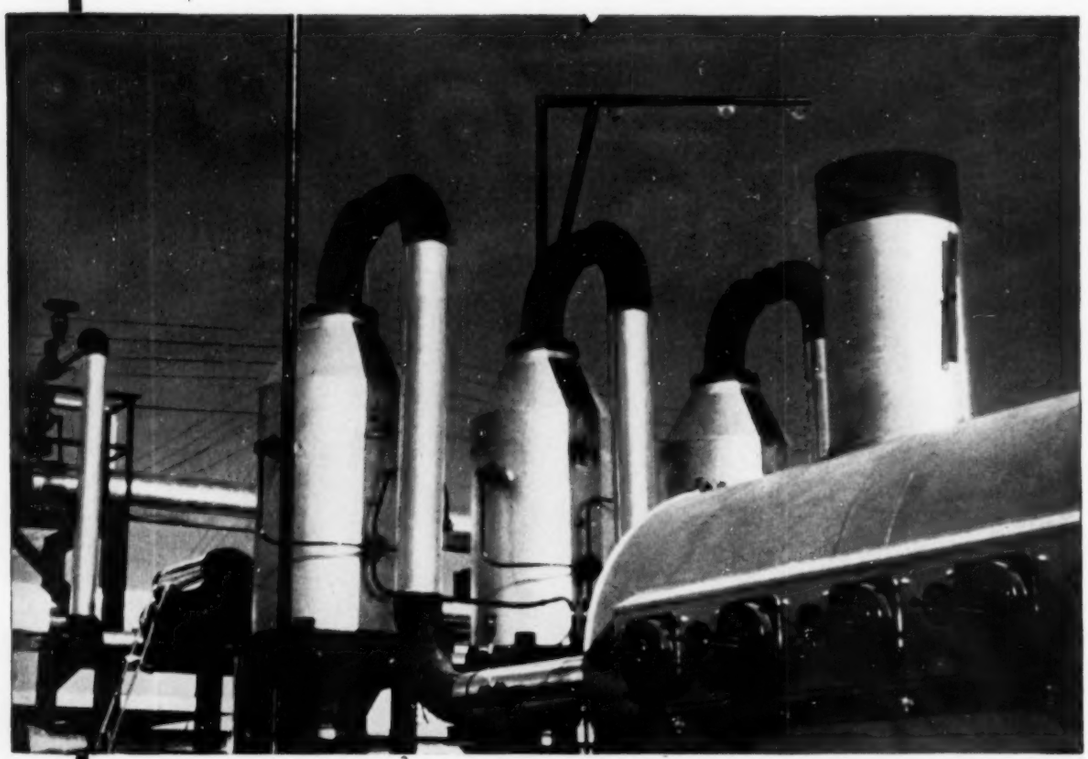

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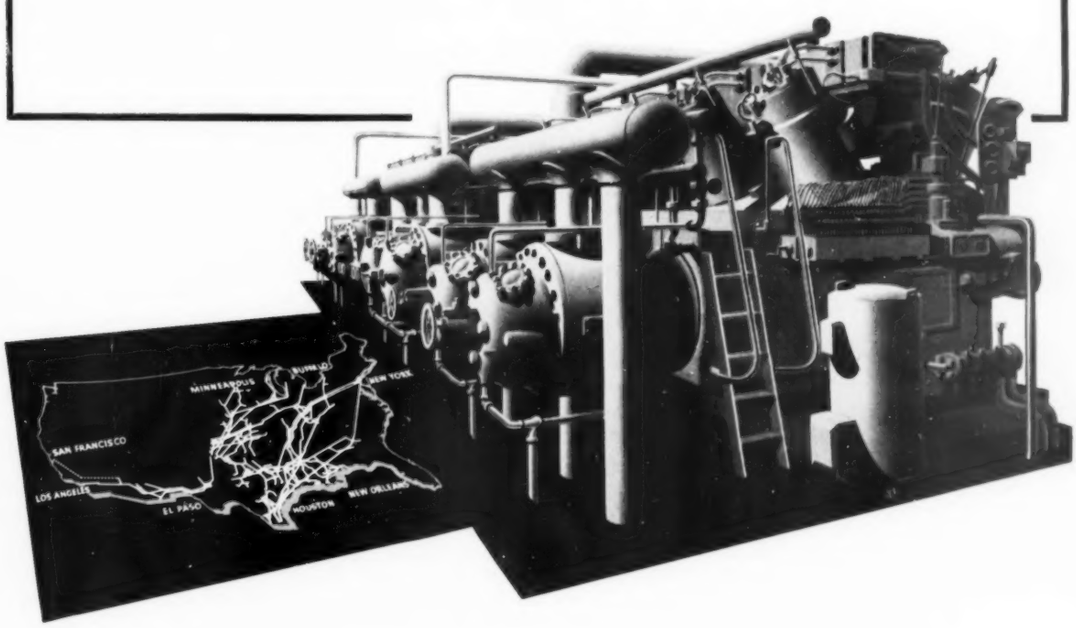

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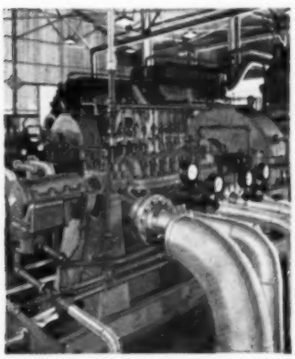
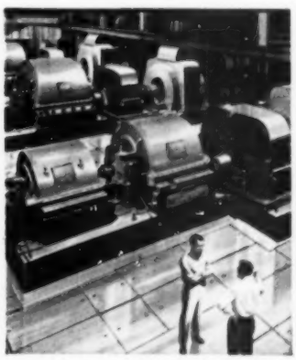


PACIFIC PUMPS, INC., Huntington Park, Calif. Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.



ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind. Rotary positive blowers, gas pumps, centrifugal blowers, exhausters; positive displacement meters.

SECURITY ENGINEERING DIVISION, Whittier, Calif., Dallas, Tex. Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.

IDECO DIVISION, Dallas, Beaumont, Tex. Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.

Look What's Back of *FLYING HORSEPOWER!*

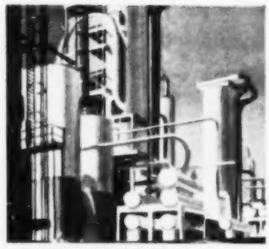
GEOLOGISTS

CONSTRUCTION WORKERS

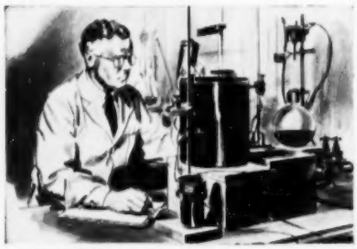
THE PICTURES on this page depict the many vital operations necessary to produce and deliver the high-quality gasoline that modern car engines require. Exploration, drilling, refining, transportation, marketing—all these activities demand highly specialized skills, an army of workers. And these skills and workers must be fused into an efficient team if the price of gasoline is to remain low.

The Makers of Mobilgas, along with the entire petroleum industry, are proud that *today's gasoline does 50 per cent more work—yet costs no more (before taxes)—than the gasoline of 25 years ago!*

DRILLERS



REFINERY TECHNICIANS



SCIENTISTS

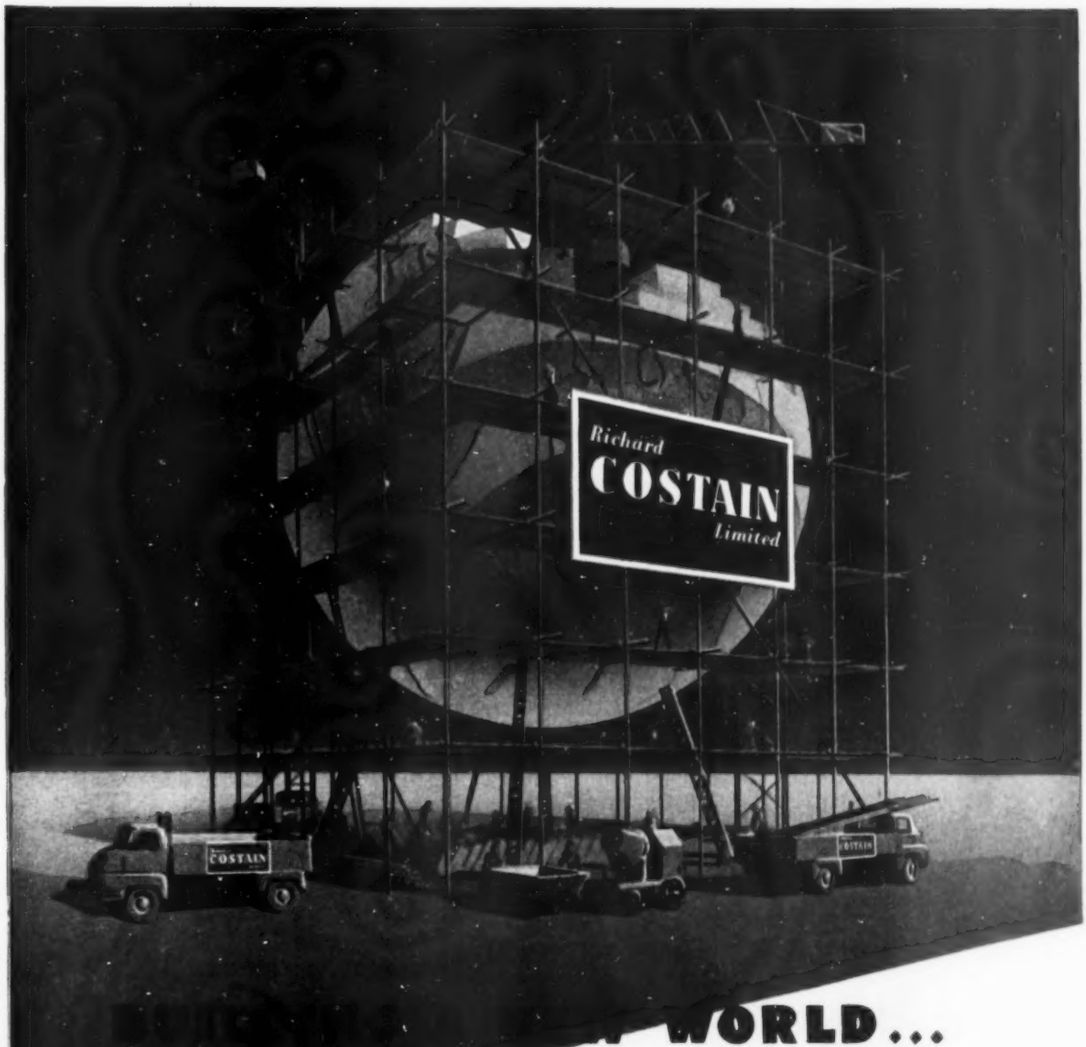
SAILORS

TRUCK DRIVERS

STATION ATTENDANTS

Mobilgas
SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC., *and Affiliates:*
MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION



WORLD...

CONTRACTORS TO THE WORLD

An irrigation scheme in Southern Rhodesia, a six arch railway bridge in Persia. A housing estate in Northern Rhodesia, Power Stations and a Wharf in Nigeria. All over the world, vast new construction projects are being entrusted to the capable hands of Costain's. Projects that will materially benefit millions of people everywhere, and here in Britain, the building of Water Conservation schemes, Houses and Hydro Electric Projects, Sea Erosion Defences and River Embankment works are all evidence of British vision and achievement as organised by . . .

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BRANCHES: MIDDLE EAST, RHODESIA AND NIGERIA

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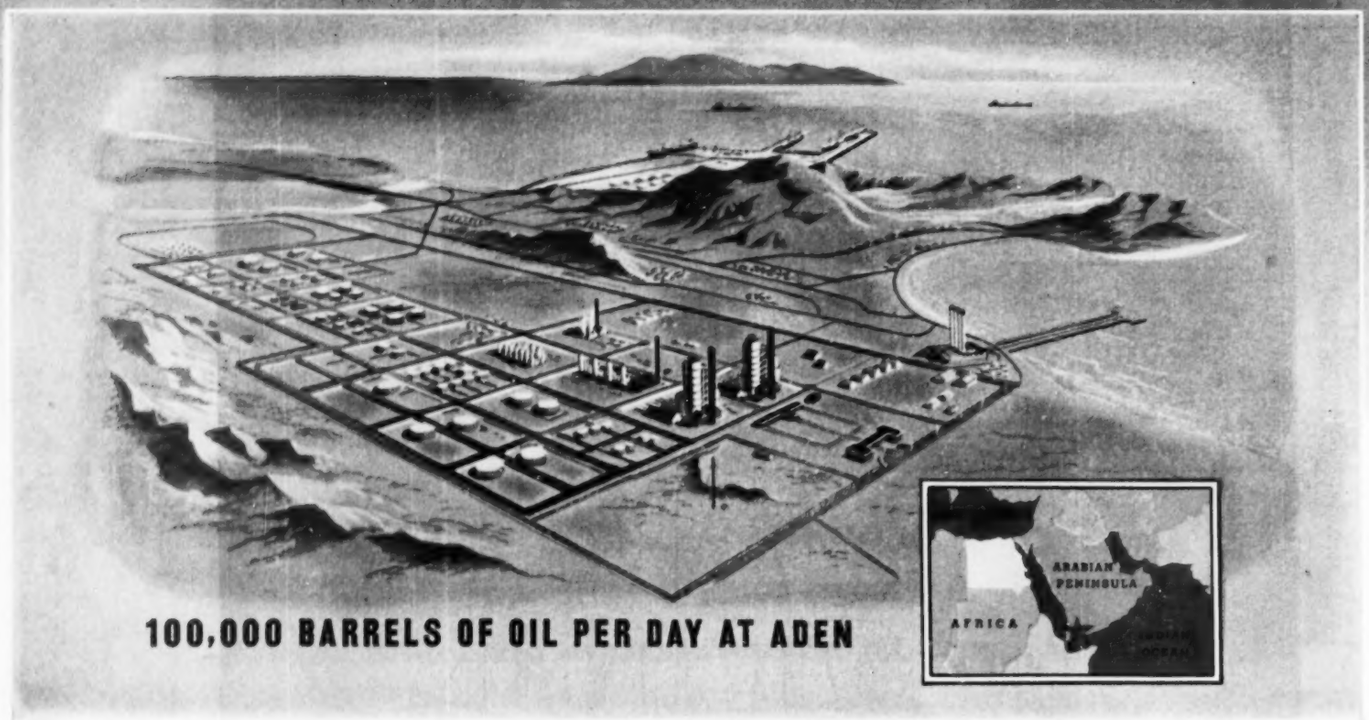


100,000 BARRELS OF OIL PER DAY AT ADEN

At Aden, on the Arabian peninsula, a new 100,000 barrels-per-day refinery is being constructed for Anglo-Iranian Oil Company—a turn-key job under Bechtel responsibility, design to refinery in operation.

The resources of experience, organization and physical equipment serving this and other Bechtel clients are readily available to petroleum companies contemplating expansion programs—of any size, anywhere.

BECHTEL CORPORATION

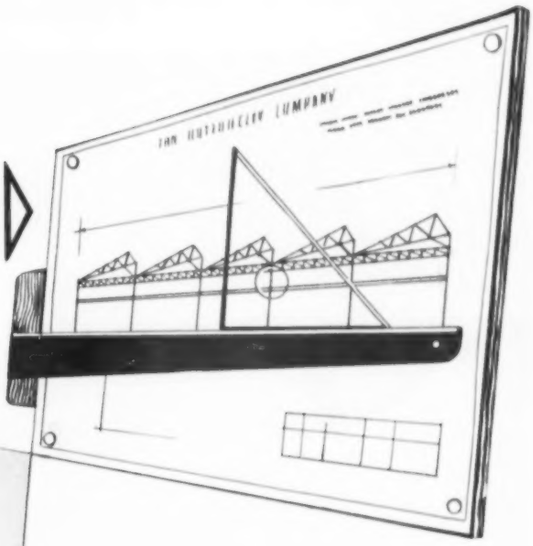
Los Angeles • **SAN FRANCISCO** • *New York*

ASSOCIATE COMPANIES: BECHTEL INTERNATIONAL CORPORATION
MIDDLE EAST BECHTEL CORPORATION

BECHTEL

BUILDERS FOR INDUSTRY

from drawing board



to erection on site

BUTTERLEY

Constructional Steelwork

The Butterley Company has been engaged in constructional steelwork from its early days and examples are to be found in all parts of the British Isles and in many countries overseas. From design, through the stages of fabrication to erection on site, every structure is invested with the skill and knowledge which have made the Butterley Company famous in the field of constructional steelwork. Welded methods are widely employed today and the shops are well-equipped to undertake the largest and heaviest work of this nature.

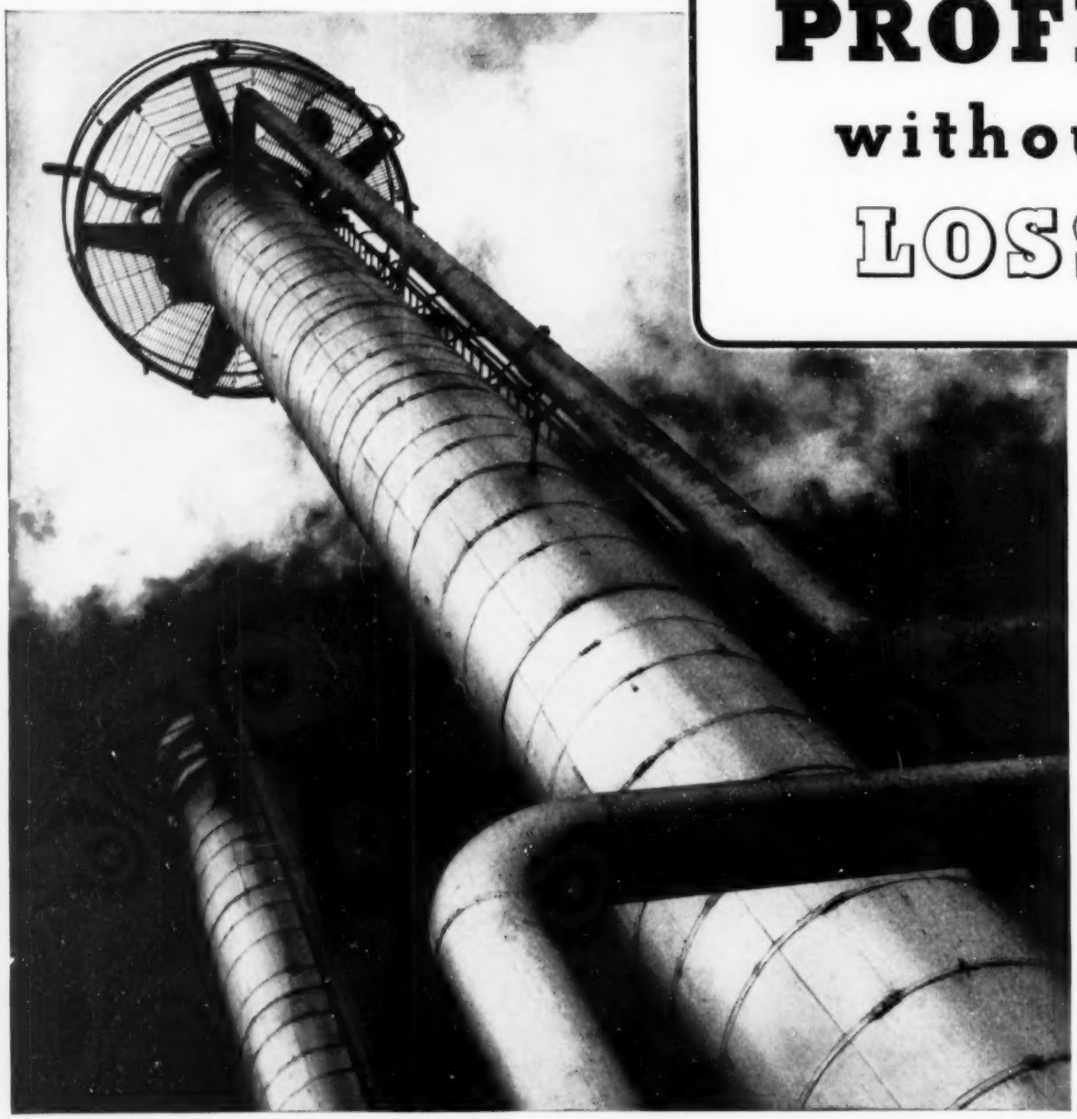
THE BUTTERLEY COMPANY LIMITED
RIPLEY, DERBY, ENGLAND

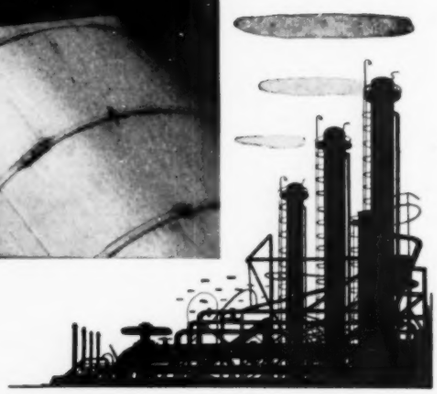
LONDON OFFICE: 20 ASHLEY PLACE, VICTORIA, S.W.1

CS-37

A Shell Photograph

PROFIT without LOSS





KENYON
Planned HEAT INSULATION

Kenyon provide a *complete* thermal insulation service to the oil industry, including technical advice on thermal insulation specifications, and finishes for all conditions. Supply of materials, application, supervision, on sites throughout the world.
The photograph shows Fractionating equipment on Distillation units at Shell Chemical Plant, Stanlow, Cheshire, England.

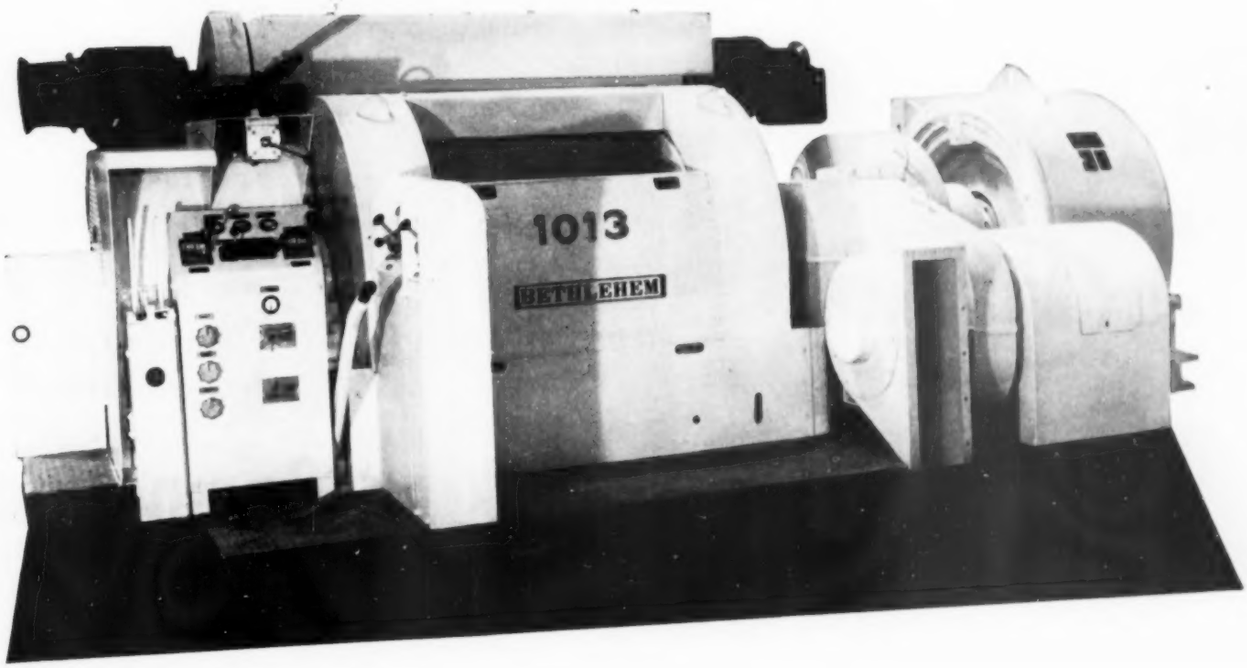
Call in KENYON to keep the heat in

WM. KENYON & SONS (AMERICA) LTD., PERTH AMBOY, N.J., U.S.A.

WILLIAM KENYON & SONS LTD., DUKINFIELD, CHESHIRE, ENGLAND

THE BETHLEHEM 1013

A POWERFUL NEW RIG FOR MEDIUM AND DEEP DRILLING



There's a new slugger in Bethlehem's big family of drilling rigs. Called the 1013, it is a heavy-duty outfit used for both medium and deep drilling jobs.

The 1013 has power to burn, and it's a sweet-running outfit. Smooth, easy to operate. All controls at the driller's fingertips. No other rig of its size has ever been as simple to handle.

It permits wide latitude in the choice of drive, being available for mechanical, electric, or hydraulic coupling or hydraulic torque-converter, whichever may be desired. It also allows complete freedom in the selection of engines and engine combinations.

This big rig, which can be furnished with upper drum when desired, has extra-capacity clutches, extra-heavy shafts and brakes. Yet despite its rugged members, it is compact . . . easy to move. Because of an unusual arrangement of transmission speeds on the No. 1 engine drive group, the drawworks need not be split to keep within prescribed road limits. Moreover, this type of arrangement makes the rig especially adaptable to electric motor or hydraulic torque-converter application.

We suggest that you get all the facts about the 1013. Write us for information; complete details will be sent promptly.

BETHLEHEM STEEL EXPORT CORPORATION

BETHLEHEM STEEL

25 Broadway
New York 4, N.Y., U.S.A.

Cable Address:
"BETHLEHEM, NEWYORK"

In addition to a full line of drilling equipment, Bethlehem manufactures a wide range of pumping units for production work.

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ADAPTED TO EACH JOB

Emulsion-breaking Breaxit compounds are specially formulated for each job. An experienced Breaxit engineer makes an on-the-spot test of the live oil your well produces. After careful study he determines the type and amount of Breaxit compound needed to give you pipe line oil. Then the nearest Breaxit distributor makes delivery of the required Breaxit compound to your lease.

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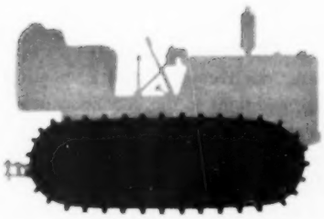
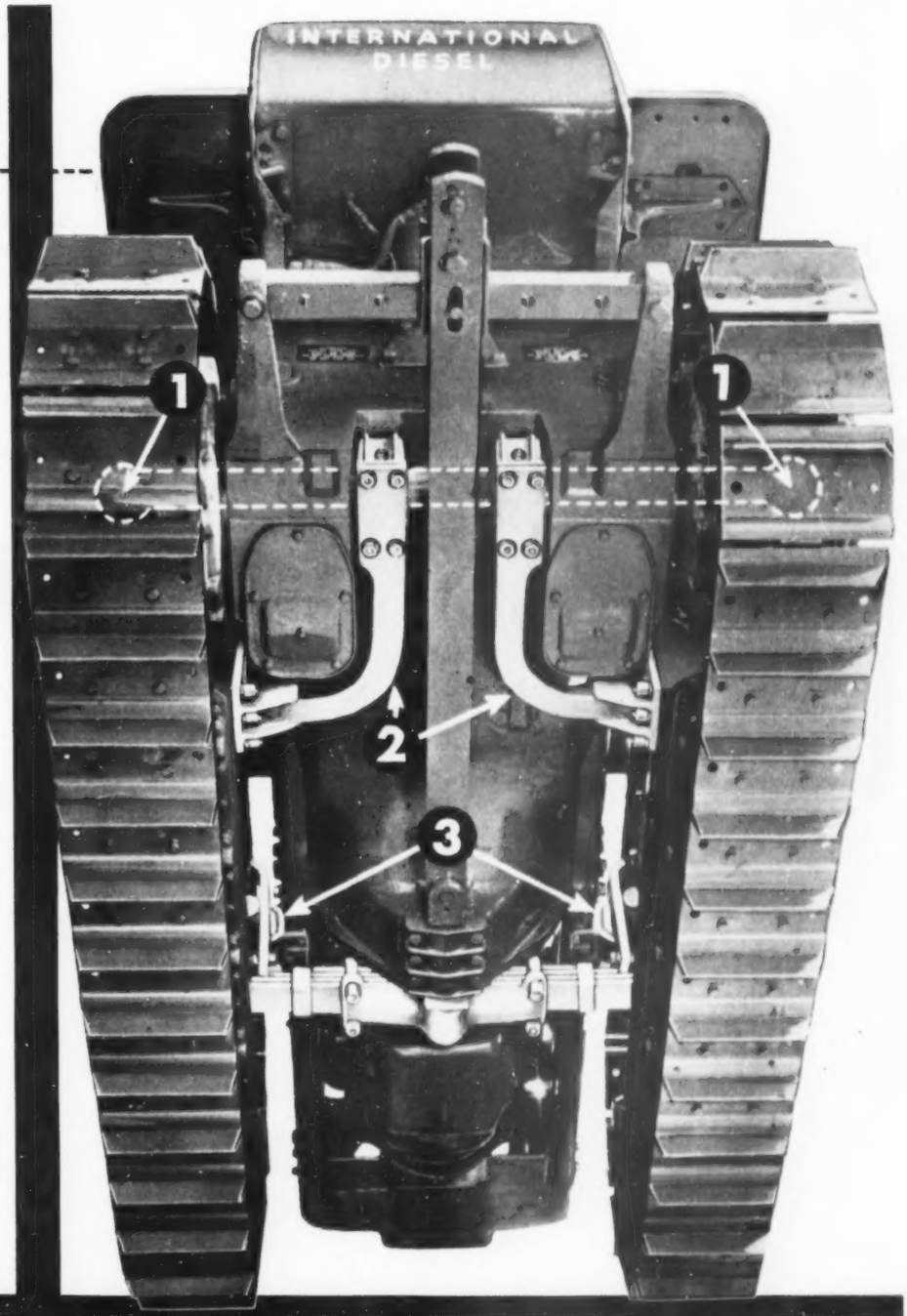


only
INTERNATIONAL CRAWLERS
offer 3-point track suspension

Engineered for Endurance

IH exclusive feature assures—

★ **Top Performance**
★ **Simplified Maintenance**
★ **Long Life**



INTERNATIONAL
INDUSTRIAL POWER

International Harvester Export Company
180 N. Michigan Ave., Chicago 1, U.S.A.

• Three-point track suspension is a feature on *every one* of the five International Crawler Tractor models – another example of International Harvester's progressive engineering.

Illustration shows how track frames are mounted on pivot shaft by ball-and-socket joints (1). Heavy steel arms (2) that slide on special bearings on the pivot shaft keep track frames from tilting in or out. Front stabilizer (3) keeps tracks in proper lengthwise alignment.

Leverage loads cannot cause track, final drive or pivot shaft misalignment . . . and that cuts maintenance problems and down time. Get all the facts on International Crawler Tractors from your International Industrial Power Distributor.

EL SEGUNDO, CALIFORNIA – This plant for the preparation of feed stock for facilities used in the production of benzene and blending stocks for aviation and quality motor gasoline was designed, engineered and constructed by Fluor for Standard Oil Company of California at their El Segundo refinery. It was completed on schedule and within the budget money appropriated. Fluor has recently been awarded another contract by Standard for the engineering and construction of a 40,000 B/D (Model IV) Fluid Catalytic Cracking Unit – the largest of its kind in the world – including fractionating, gas recovery, caustic treating, hydrogen sulfide removal, additions to the alkylation unit, alterations to the naphtha re-run stills, and offsite engineering – all part of the $20 million expansion program now in progress. Whatever your plans include – a completely integrated plant or the expansion of existing facilities – Fluor's knowledge and experience to design and build for the refining and processing industries, are at your disposal.

THIS PLANT DESIGNED AND CONSTRUCTED BY THE FLUOR CORPORATION LTD. LOS ANGELES

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
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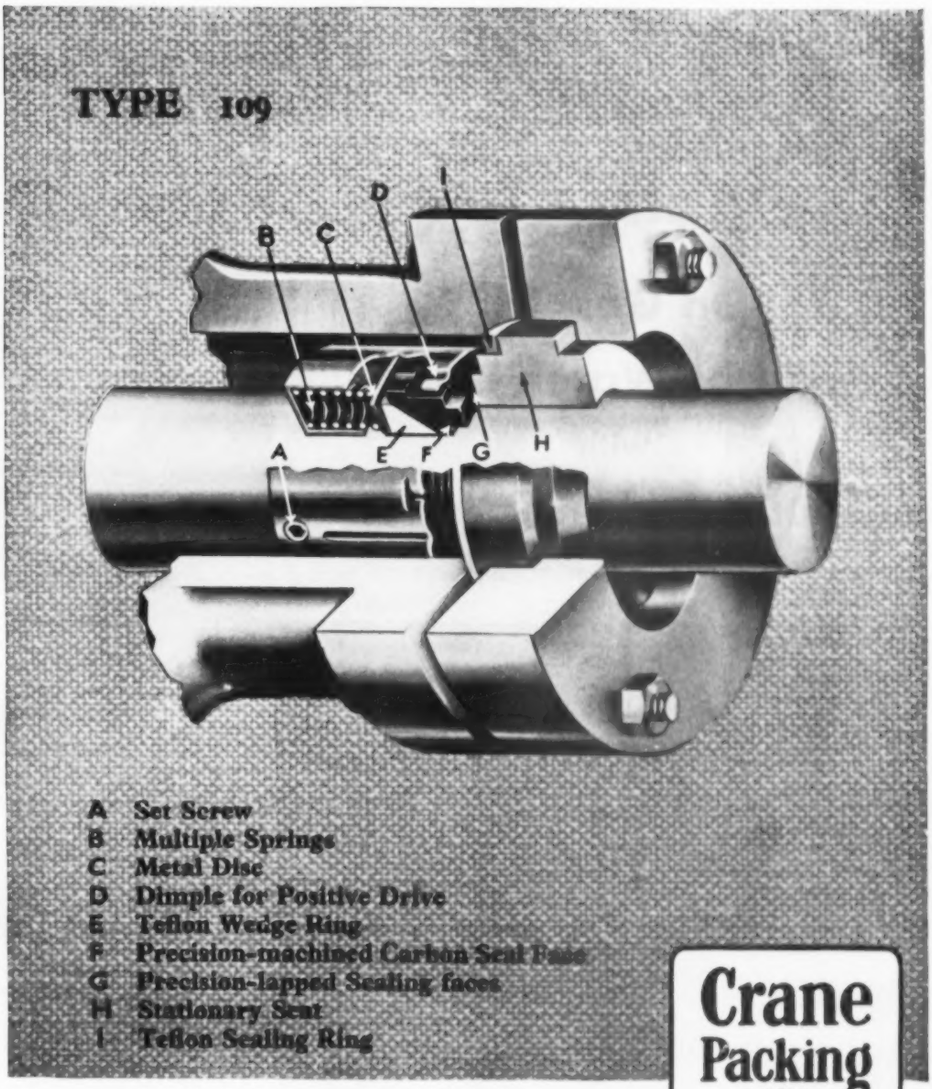
A Mechanical Shaft Seal



for High Temperature & Corrosive Services

Crane Packing LTD OF SLOUGH ENGLAND A COMPANY

This Type 109 Mechanical Shaft Seal will seal off corrosive fluids or gases which are being handled at temperatures up to 485° F. and at pressures up to 750 p.s.i. on such applications as centrifugal pumps, turbines, positive displacement pumps, agitators, etc. It is the first Seal of its kind to be manufactured in this country—it is precision engineered and corrosion resistant materials can be used for each component.

In order to impart to the assembly the required degree of flexibility a flexible wedge ring is used (see "E" on diagram). The new chemically inert polymerised plastic fluorethylene known as Teflon in the U.S.A. and as Fluon in this country, is the material from which this wedge ring is formed by means of special moulding and machining processes. All metal parts can be of stainless steel, or special alloys, depending on the nature of the service conditions.

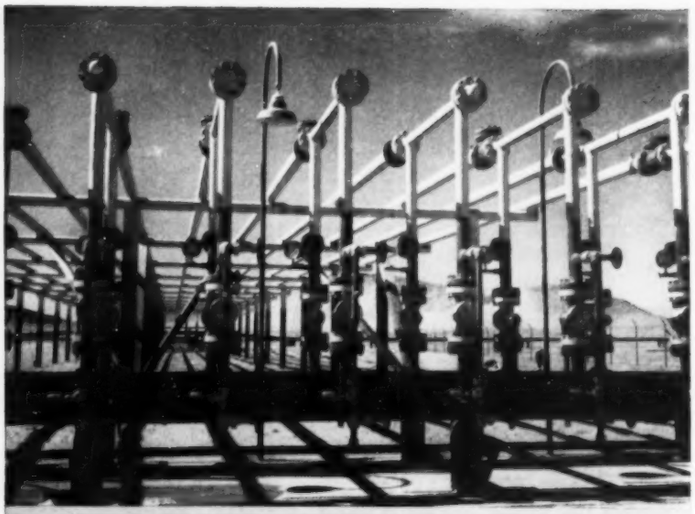
Interested Engineers are invited to send for illustrated literature describing the Type 109 Mechanical Shaft Seal.

This is one of the many mechanical shaft seals which we manufacture for a wide range of services. We manufacture this design of seal by agreement with the Crane Packing Co. of Chicago, U.S.A.

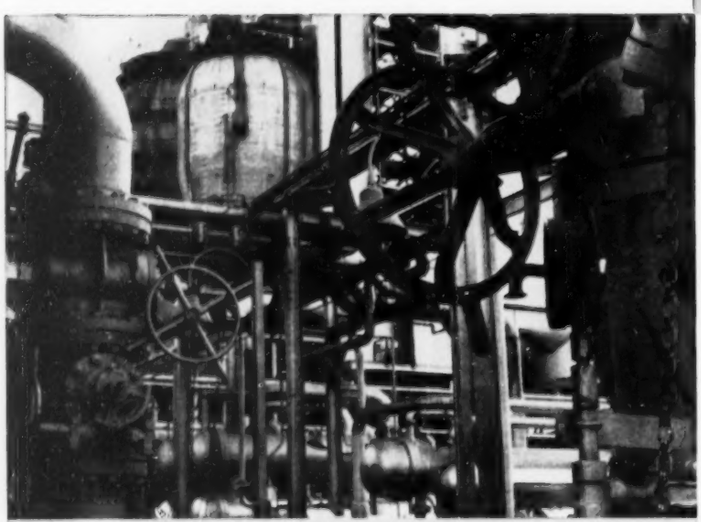
CRANE PACKING LIMITED, SLOUGH, BUCKS.

POSITIVE CONTROL

On Gas, Oil or Hot Water Lines with AUDCO-Nordstrom Valves



GAS Manifold of Audco-Nordstrom valves installed on gas lines at a separating station in Saudi-Arabia.



OIL Gear-operated Audco-Nordstrom valves on lines carrying rich oil at a refinery in England.

Chances are your plant has lines carrying gas, oil or hot water. Perhaps it uses all three. If so, there is one type of valve that can solve your problems on all of these services—an Audco-Nordstrom Lubricant-Sealed valve.

The internal system of lubrication in Audco-Nordstrom valves does three things not possible in non-lubricated valves—provides a positive seal against leakage, keeps the valve ready to operate easily at any time, and protects the vital seating area from corrosion and abrasion.

Every service presents its own special problems but by matching the service to the type of Audco-Nordstrom valve and lubricant required, you can assure yourself of trouble-free valve operation for many years to come.

AUDCO and Nordstrom

BRITISH

AUDLEY ENGINEERING COMPANY, LTD.

Newport, Shropshire, England

OVERSEAS AGENTS located in South Africa, Australia, India, Trinidad, British West Africa, Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Spain and Portugal.

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ROCKWELL MANUFACTURING COMPANY

400 North Lexington Avenue
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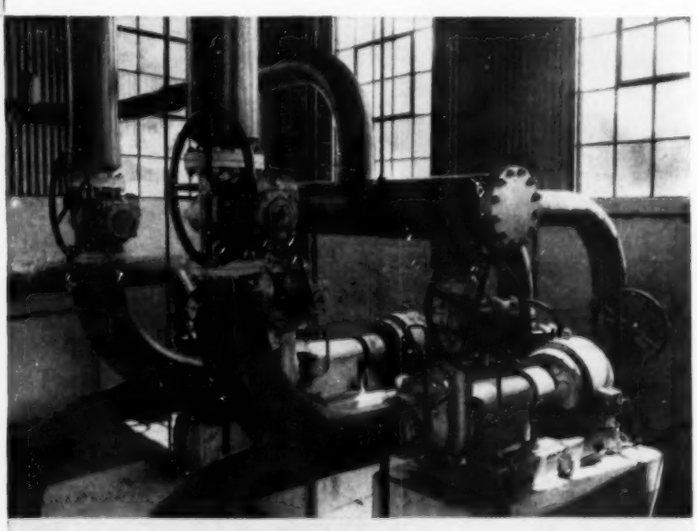
EXPORT: International Division, Rockwell Manufacturing Co., 7701 Empire State Building, New York 1, N. Y.

CANADIAN LICENSEES: Peacock Bros., Montreal, Quebec.



HOT WATER Audco-Nordstrom valves on hot water pump lines in a large boiler house.

The Lady was for burning

In rural Indo-China, a farmer once offered a traveler his prettiest daughter in exchange for a reading lamp and a drum of kerosene.

This happened, not fifty years ago, but within the last decade.

It is hard for Americans to imagine what life is like in the "have-not" nations of the world. Some communities in Honduras have never seen petroleum, nor any product thereof. In Western Africa it is not unusual to find one lamp in a tribal group of 15,000 people.

The fact that a country has no petroleum resources of its own is not always the reason for oil poverty. Many so-called "have-nots" live in land where oil could be found. What they really "have not" is the initiative to look for it!

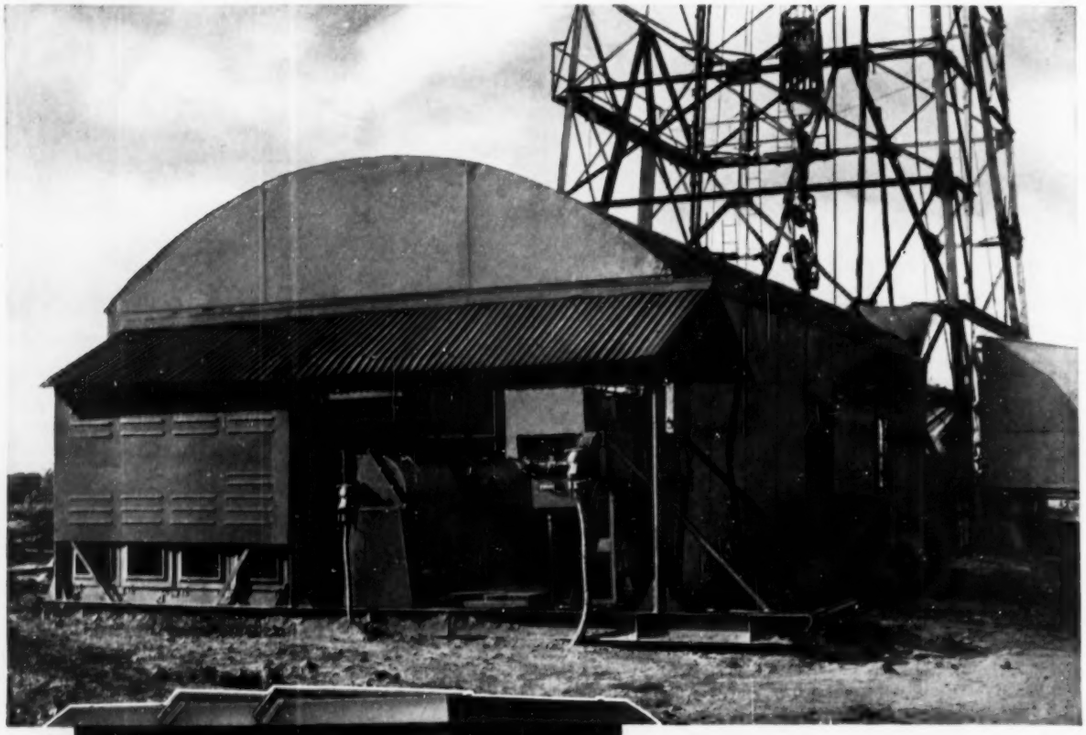
The oil companies of America have a super-abundance of that great natural resource—Initiative. It is essential to their success. They cannot afford to discourage easily, for the odds are ten to one against a wildcat becoming a producer.

In spite of these odds, Cities Service has discovered some of America's historic oil fields. In the last five years, its geologists have added millions of barrels of much-needed oil to our national reserves. Because of these men, and others like them throughout the industry, we can be sure our country will never be one of the petroleum have-nots of the world.

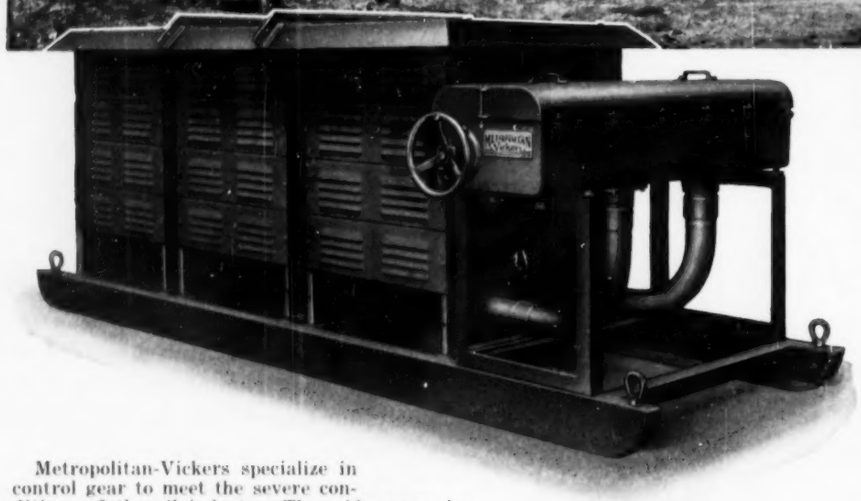
CITIES SERVICE

Quality Petroleum Products

Control gear in the oilfield



Above: M-V control equipment for the drill, hoist and slush pump motors, mounted as a transportable unit.



Left: One of several rotor control regulators supplied to an Eastern oil company.

Metropolitan-Vickers specialize in control gear to meet the severe conditions of the oil industry. The wide range includes drum and contactor controllers complete with resistances, arranged for interlocking if necessary.

Air-break, oil-break, hand-operated or contactor control gear for the refinery and the oilfield can be supplied with flameproof or non-flameproof enclosures.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

MANCHESTER 17, ENGLAND

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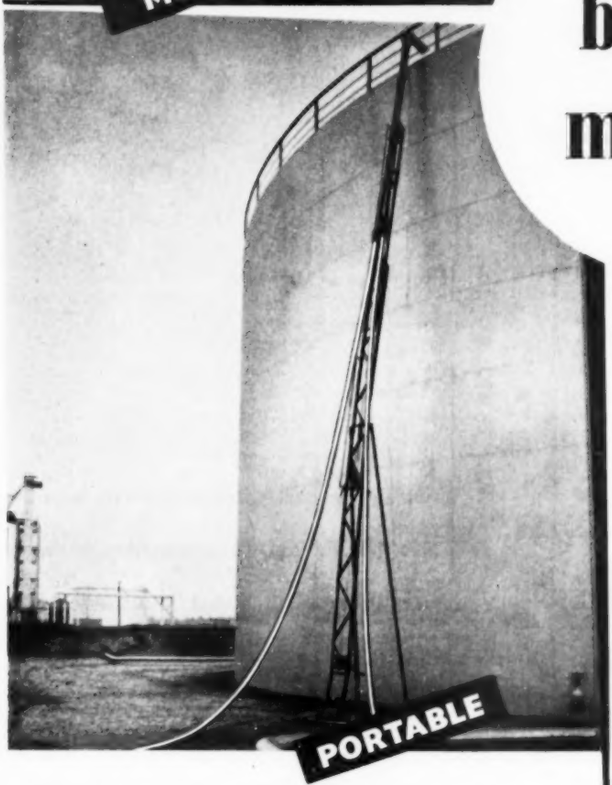
IRAQ—Dwyer & Co. (Iraq) Ltd., Airlines House, King Faisal Ave., Baghdad.

INDIA—Associated Electrical Industries (India) Ltd., Crown House, 6, Mission Row, Calcutta 1.

Fire Protection for the Oil Industry

by all means



MOBILE. Pyrene mobile Foam-CO_2 Fire tenders are the most advanced fire-fighting vehicles of their kind and are today's answer to major fire dangers in Refineries and Tank Farms. They are designed and equipped to meet specialized requirements. There is also a range of Pyrene Mobile Foam Trailers.

PORTABLE. Pyrene Portable Foam Towers are made to facilitate the application of foam to floating roof tanks or normal storage tanks having fractured roof plates. This equipment is readily manoeuvred and erected by four men. Fitted with self-sustaining winch and foam pourer. Maximum extension 50 feet.

FIXED. Where oils or spirits are stored in bulk, one or other of the various types of fixed Pyrene Mechanical Foam Installations provide the highest degree of practical fire protection. Pyrene specialized equipment in this field is of maximum efficiency, the outcome of many years of experience, and research.

FIRST-AID. The Pyrene Company provide the widest range of hand fire extinguishers, designed to meet every class of fire risk throughout the Refinery area including laboratories, electrical plant, and office buildings. They include: Pyrene Fire Extinguishers, CO_2-Dry Chemical Fire Extinguishers, CO_2 Extinguishers, "Phomene" Foam and "Conquest" Soda-acid and water type Extinguishers.

Pyrene TRADE MARK
FIRE FIGHTING EQUIPMENT

The free and impartial advice of Pyrene Fire Engineers is always available to assist you with your fire problems, or illustrated literature will gladly be sent on request to Dept. WP. 10

VICtoria 3401 Cables: "Pyrene-London" **THE PYRENE COMPANY LTD.,** *9 Grosvenor Gardens, London, S.W.1., England*

prelude to a partnership

When a petroleum refiner decides to do business with Universal, he immediately becomes something more than just a customer. He actually enters a partnership with an organization whose interests are parallel to his own.

Universal's objectives are basically the same as the petroleum refiners' . . . to provide continuing improvement of products from petroleum through constant advancement in

refining methods and techniques. Universal endeavors to accomplish these objectives in a manner that will result in the greatest economic advantage to the petroleum refiner.

As originators and developers of many of the most successful refining processes, Universal has only a single purpose to pursue—the progress of its customers—progress based upon the intelligent understanding of processing requirements and sound interpretations that provide effective solutions to the industry's most complex problems.

The petroleum refiner's interests are our interests—his success, our success. We like to think about him as our partner—not just a customer. Unusual as it sounds—Prelude To A Partnership—does have a significant meaning in our business.

UNIVERSAL OIL PRODUCTS COMPANY

UOP®

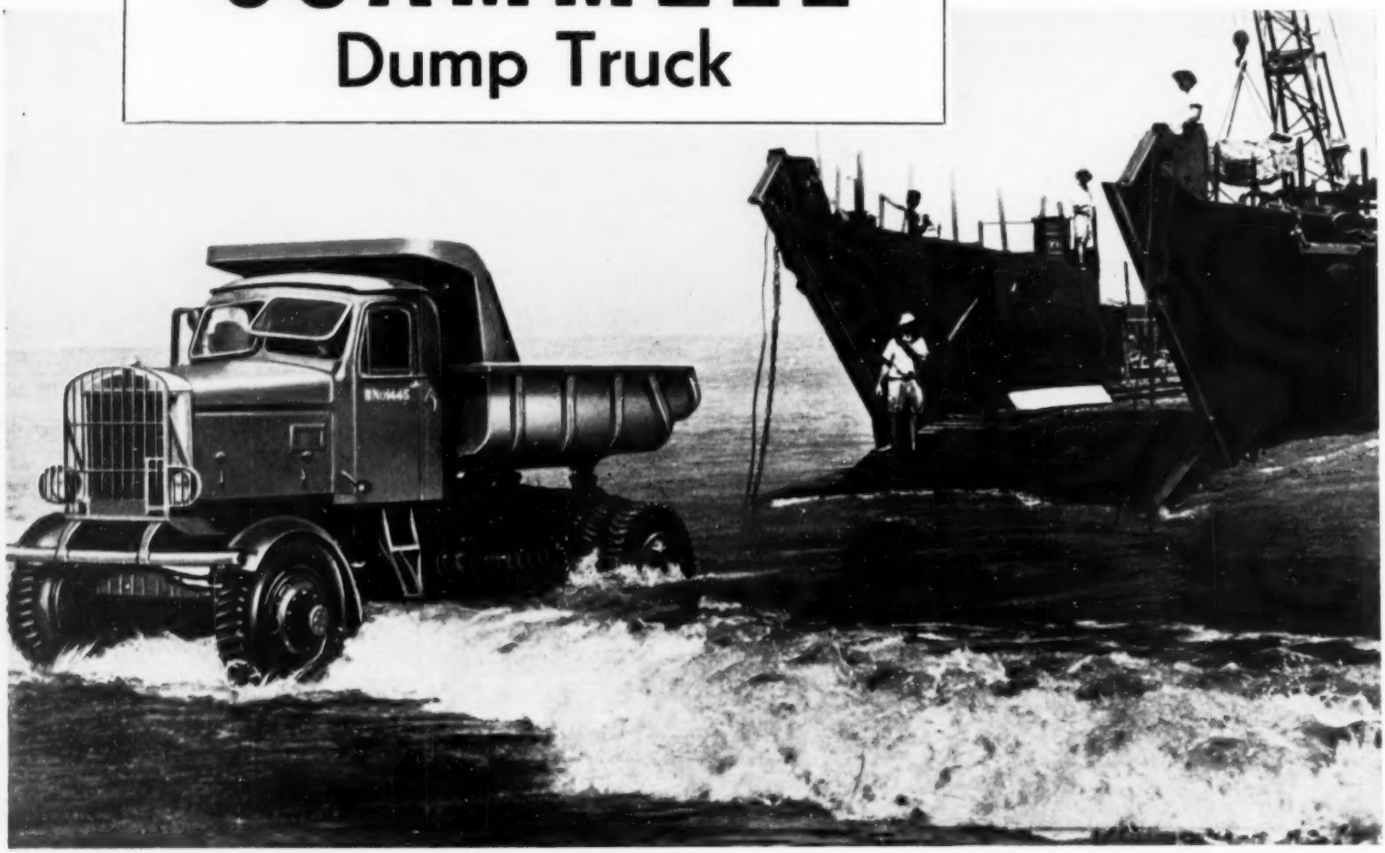
30 ALGONQUIN ROAD, DES PLAINES, ILL., U.S.A.

Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Investment

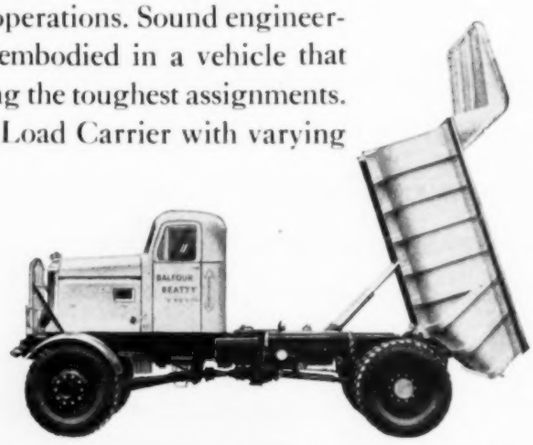
The SCAMMELL Dump Truck

Illustration shows a Scammell 4 x 4 playing its part in combined water and land transport of drilling stores for a new Shell exploration area at Bulak-Setap, near Meri, British North Borneo.



A Powerful asset on any job!

The Scammell "Mountaineer" four-wheel drive Dump Truck has been exclusively designed to meet arduous demands of some "off the highway" operations. Sound engineering practice, coupled with the finest materials available, is embodied in a vehicle that will give long life and reliable and economical service during the toughest assignments. The "Mountaineer" 4 x 4 is also available as a Tractor and Load Carrier with varying wheelbases.

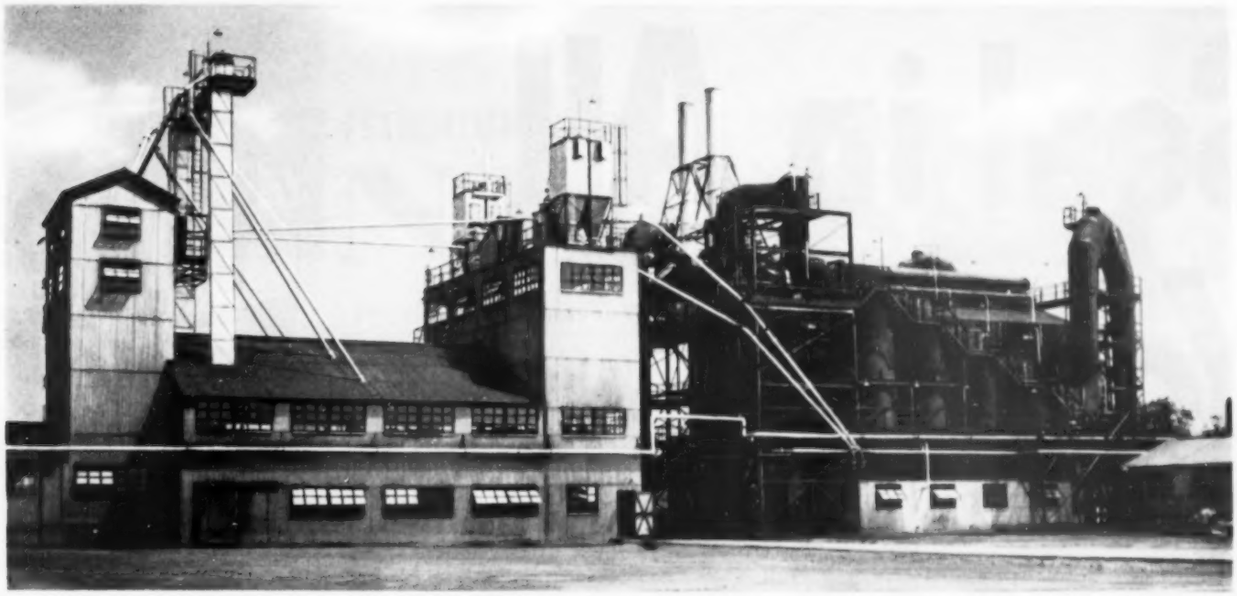


Whatever your transport need

—There's a Scammell for the job!

SCAMMELL LORRIES LTD · WATFORD · HERTS · ENGLAND

Telephone: **WATFORD 5231** ***Telegrams:*** **TWELFTON, WATFORD**



NEW INDUSTRY *for Canada*

The Furnace Carbon Black plant of Cabot Carbon of Canada Ltd. is Canada's first oil furnace carbon black plant.

The principal process equipment was designed by Cabot Engineering Company of Pampa, Texas, affiliates of Cabot Carbon of Canada, Ltd. Stone & Webster Canada Limited, with the assistance of Stone & Webster Engineering Corporation, furnished consulting services and constructed the plant.

STONE & WEBSTER ENGINEERING CORPORATION

Affiliated with STONE & WEBSTER CANADA LIMITED

Cabot Carbon of Canada Ltd.'s new plant at Sarnia, Ontario, supplies high abrasion furnace black and fast extruding furnace carbon black for Canadian-made tires and other rubber goods.

Seal in All Your Horsepower!

with the Veedol Motor Oil

"Film of Protection"

USE all the horsepower built into your powerful engine! Seal *in* the great performance your car can give . . . with the world-famous VEEDOL "Film of Protection."

VEEDOL Motor Oil forms a protective anti-corrosion film on metal surfaces . . . helps keep soot, contaminants and gasoline out of your crankcase . . . fights the ravages of acid "engine sweat." So . . .

Don't waste horsepower! Use all the power your car can deliver. Change to VEEDOL Motor Oil . . . today!

TYDOL

TIDE WATER ASSOCIATED OIL COMPANY
New York Tulsa San Francisco

FEDERAL TIRES
Federal Flying -A- Tires . . .
Good for a long safe ride!

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DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

October ★ One of a Series of Interest to the Petroleum Industry ★ 1953

A Million $ a Week for Research

Du Pont spent $52,000,000 for its research program last year. And this sum was exclusive of construction costs for new research facilities.

In spite of its high cost, the Du Pont Company believes research offers the best assurance for long-range job security. New job opportunities are created through the new products it develops.

It also helps to create new market opportunities for many basic raw materials. Petrochemicals are an outstanding example of this and Du Pont buys increasingly larger quantities of them every year.

Du Pont Research Program to Help Refiners Solve Pre-Ignition Problems

Pre-ignition during road operation is a definite obstacle to further improvement in the efficiency of fuel utilization in gasoline engines.

The development of higher compression engines makes the need for a solution to this problem—which possibly exceeds knock in importance—all the more pressing. With the aim of helping refiners overcome pre-ignition through the use of additives, the Du Pont Petroleum Laboratory has already done extensive research.

The laboratory has found that the two most important aspects of the problem are: (1) the tendencies of combustion chamber deposits to glow and cause surface ignition of the charge; and (2) the ability of fuels to withstand ignition by hot surfaces.

Deposit glow can be minimized by certain fuel additives. With future higher compression ratio engines it may also be necessary to improve the ability of fuels to withstand hot surface ignition.

EFFECTIVENESS OF TEL

Glowing deposits, principally those flaky in nature, act as igniters and some hydrocarbons are more sensitive to ignition by these hot deposit particles than others.

However, by raising the octane rating as for example *with tetraethyl lead, the pre-ignition tendency of the gasoline is reduced.*

"Magic Barrel"

40 OUTSTANDING PRODUCTS DERIVED FROM PETROLEUM MAKE UNIQUE PUBLIC RELATIONS PRESENTATION

The "Magic Barrel" *looks* like a 55-gallon oil drum.

But, instead of crude oil, the drum contains a wide variety of *finished* products made from petroleum . . . products used every day in the home, on the farm, in industry and on the highways. All of these have been woven into a unique presentation that shows the tremendous importance of petroleum in our daily living.

PETROLEUM is the important ingredient in all the products shown in this "Magic Barrel" display. Mounted on semi-circular trays, the whole display is built up out of the oil drum in the center.

The display and the talk accompanying it were put together by the Du Pont Petroleum Chemicals Division. The show was designed, however, to be used by oil industry representatives, as a public relations presentation. It is both entertaining and educational. As such it is ideally suited for showings to schools and colleges, civic organizations and luncheon clubs, as well as to employee and customer groups.

More complete details on these investigations by the Du Pont Petroleum Laboratory can be obtained from any Du Pont Petroleum Chemicals Division district office. Ask for papers entitled "Pre-Ignition in Automotive Engines" and "An Investigation of Pre-Ignition in Engines."

FLEXIBLE PROGRAM

The speaker builds his theme of "better living from petroleum products" by displaying and demonstrating the many interesting products found in the barrel. The talk is extremely elastic and can be done in 30 minutes or extended to an hour.

The barrel itself is made of aluminum and split lengthwise into two sections. These are hinged together so that the drum can be opened and used as a lectern by the speaker. There are 16 removable shelves inside the barrel. Each holds a small display of related products. Products can be changed or added at the will of the speaker.

3 BASIC NEEDS

The presentation covers the three es-

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OVER

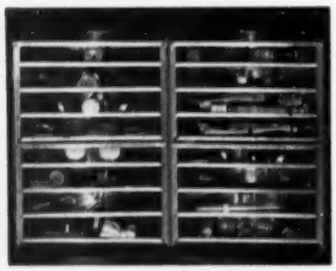
DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *"Magic Barrel"*

sential needs for living: food, clothing and shelter. Protective wrappers, refrigerants, insecticides and weed killers, for example, are all important to food production and distribution.



INSIDE THE "MAGIC BARREL," the trays of products are compactly arranged for convenient shipping.

Synthetic fibers, of course, play an important role in our modern clothing industry. And there are numerous plastics, paints, upholsteries, brushes and

MAKING SYNTHETIC RUBBER right on top of the barrel adds a unique touch of showmanship to the presentation.

other products made from petroleum which are used every day in the home and are included in the display.

The "Magic Barrel" is even a *factory* for making synthetic rubber. Starting with a liquid polymer, rubber balls are produced in a matter of seconds. These are tossed out to the audience as souvenirs.

AVAILABLE TO YOU

If you would like to make use of this presentation in your own public relations program, just get in touch with the nearest Du Pont Petroleum Chemicals Division district office.

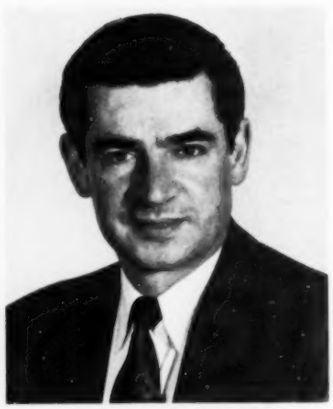
Sales-Service Representative

ARTHUR C. SANTORA joined the Du Pont Company in 1950 as a sales-service representative of the Petroleum Chemicals Division's eastern district.

His association with the petroleum industry began in 1943 as a research engineer for the Standard Oil Development Company. During the next seven years his work included research on polymerization, hydrocarbon synthesis, inhibitors, aviation gasoline and a wide variety of petroleum refining problems.

A graduate of Union College with a B.S. in chemistry, Mr. Santora received his M.S. in physics from Cornell in 1940 and his Ph.D. in organic chemistry from the University of North Carolina in 1943. He has also taught mathematics, mechanics and analytical chemistry.

He is a member of the American Chemical Society and the Society of Automotive Engineers.



ARTHUR C. SANTORA

Additive to Improve Diesel Fuels

Du Pont Fuel Oil Additive No. 2, originally developed as a stabilizer and dispersant for distillate fuel oils used in domestic oil burners, also offers a number of advantages to diesel fuel refiners.

Being ashless, it leaves no combustion chamber deposits to cause operating difficulties.

To help refiners gain added flexibility and capacity in diesel fuel production, Fuel Oil Additive No. 2 enables them to blend cat-cracked and straight-run stocks. This additive also allows a certain amount of heavy oil to be blended in the diesel fuel without giving undue difficulties with filterability. In this way, it enables refiners to upgrade their heavy fuel oils.

To prevent clogging of diesel filter screens, Fuel Oil Additive No. 2 not only retards the formation of insoluble residues, but also reduces the particle size of those insoluble residues that are formed.

Storage tests show that in all cases Fuel Oil Additive No. 2 gives best results when added at the refinery to freshly prepared stocks.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, technical papers and aids available to you through any of the Du Pont Petroleum Chemicals Division district offices listed below:

Pre-Ignition in Automotive Engines—This paper discusses mainly the glowing tendencies of combustion chamber deposits and the pre-ignition tendencies of individual hydrocarbons . . . . . Serial A-5652

An Investigation of Pre-Ignition in Engines—A comprehensive discussion of how compression ratios and other mechanical factors affect pre-ignition. Also the effect of tetraethyl lead in reducing pre-ignition . . . . . Serial A-5756

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens. . Serial A-5201

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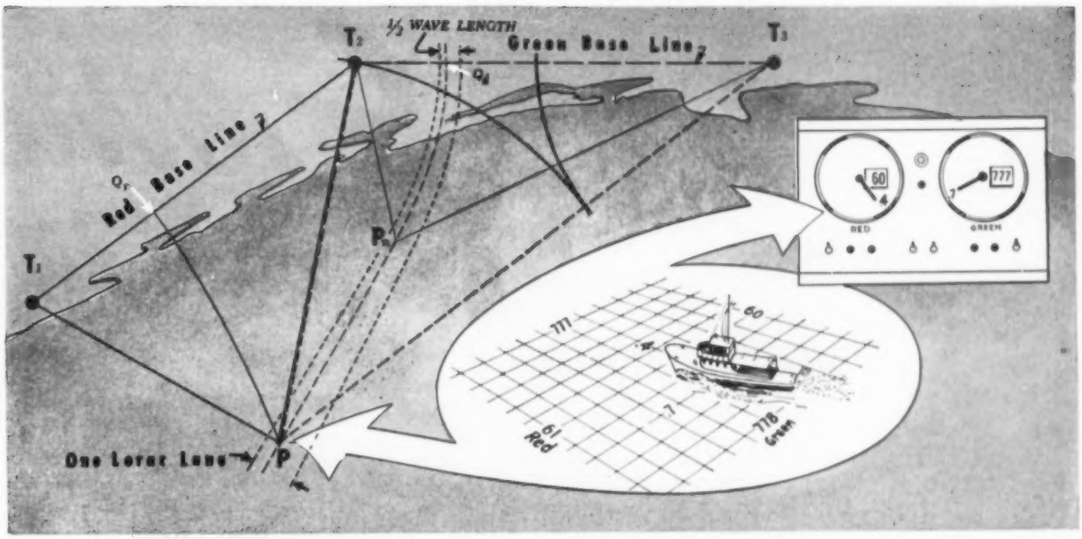

LORAC---
its purpose and principle

The purpose of Lorac is to provide an accurate and convenient means of establishing position. A position not dependent on visibility, or on the use of short-range, *high-frequency* radio waves.

The basic principle of Lorac is the determination of the position at a point P with respect to three low frequency radio transmitters.

This is accomplished by phase-meters which indicate indirectly the *difference in distance* between the point P and two fixed land-base transmitters such as T_1 and T_2, or T_2 and T_3.

With only two transmitters there are a series of points whose *difference in distance* to the transmitters is the same. This series of points (P, P_n, etc.) lie on a hyperbolic curve.

Therefore to obtain a fix at point P, three transmitters are required providing two hyperbolas whose intersection locates the exact point in question.

The Lorac phase-meters indicate position to 1/100 part of the spacing between two hyperbolic lines called "lanes" which are separated on the base-line by a distance equal to ½ the wave length of the transmitted continuous-wave signals.

Thus an accuracy of *plus or minus 2.5* feet is possible on the base-line between the transmitters of the Gulf Coast Lorac networks.*

This accuracy decreases somewhat out to sea due to the lane expansion. However, for distances up to 100 miles off-shore, the positioning accuracy of Lorac is more than sufficient for all types of geophysical operations.

* Three networks in operation covering an area from off the Coast of Freeport, Texas, to Caillou Bay, Louisiana.

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IN THE APPLICATION OF RUBBER TO OIL PRODUCTION –

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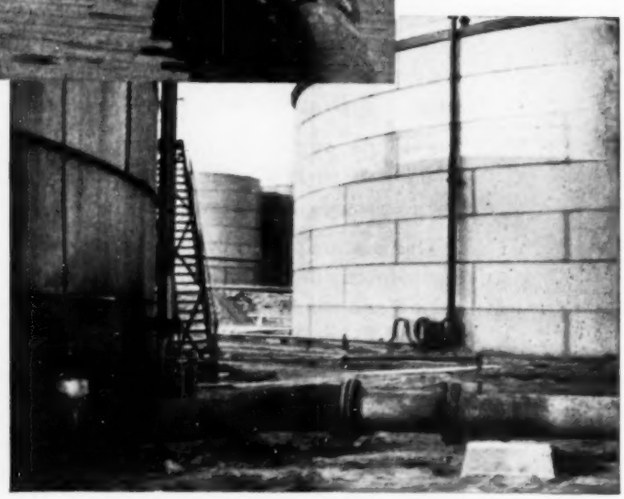
Simply contact your nearest Dunlop representative or distributor. Or you may prefer to get in touch with Dunlop Manchester headquarters.



Dunlop Oil Suction and Discharge Hose bridging the gap between pipe line and storage tank. This type incorporates high-quality, hard-wearing, oil resistant synthetic rubber compounds, and is suitable for the severest conditions.

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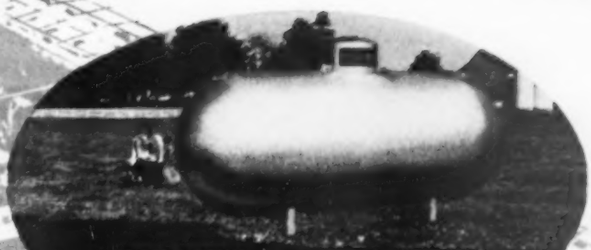
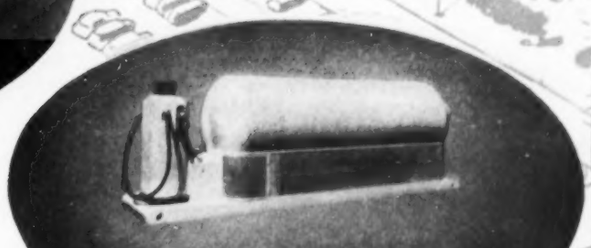
ANHYDROUS AMMONIA TANKS — for truck, trailer and tractor mounting, packaged bulk storage stations.



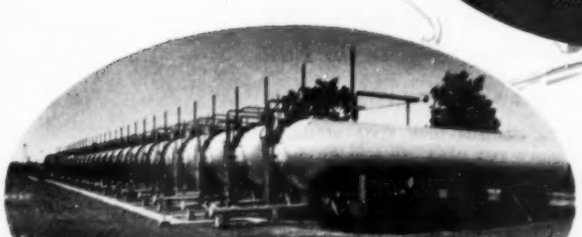
LP-GAS SYSTEMS — storage tanks, packaged filling stations. Pressure bulk storage.

TRANSPORTS — for L-P Gas and anhydrous ammonia.

CAST STEEL FITTINGS — flanged, screwed, refinery return bend, and pipeline flanges.



PACKAGED LP-GAS STATIONS — for servicing vehicles which use butane or propane for fuel.



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SINCE 1918

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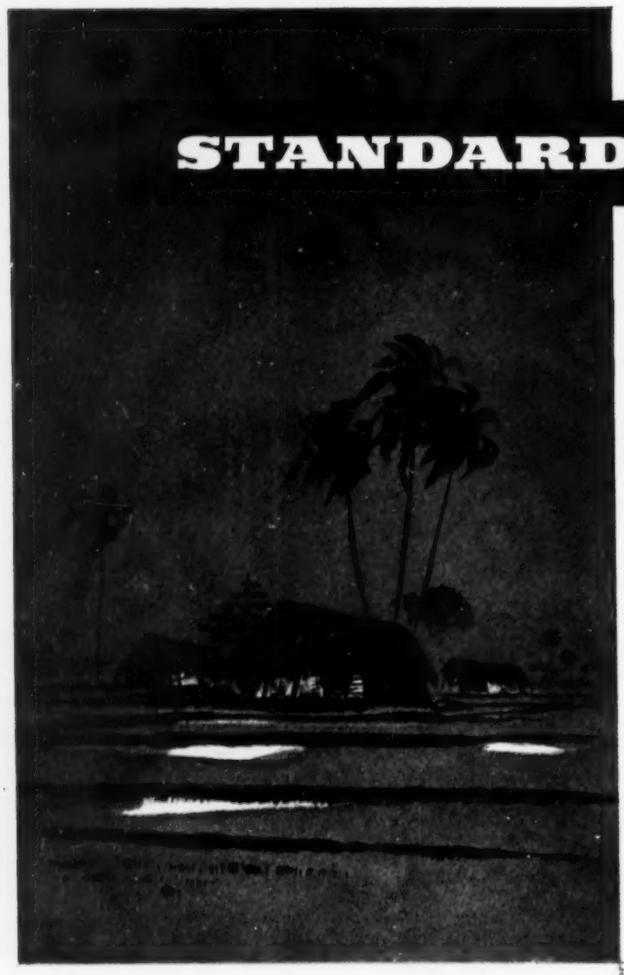
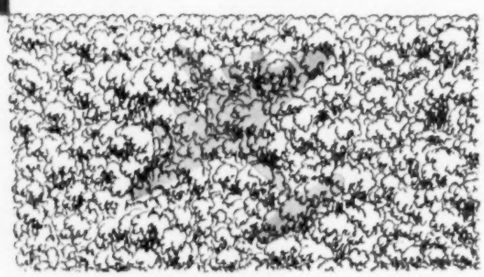
STANDARD-VACUUM



When night steals over the paddy fields of Java, kerosene burns in the farmers' lamps to drive the darkness away • When an airliner sets down in Bangkok, hundreds of gallons of high octane aviation fuel pour into the tanks which feed its powerful motors • A road reaches into the back country of Luzon; asphalt from oil gives it a hard, smooth surface • And when a tramp steamer sails from Mombasa, bunker oil may turn the screws as they churn the waters of the Indian Ocean.

From Tokyo to Karachi; from the minerally rich highlands of Southern Africa to the coastal cities of Australia and New Zealand, the varied petroleum products of Standard-Vacuum weave in some way through the whole pattern of living.



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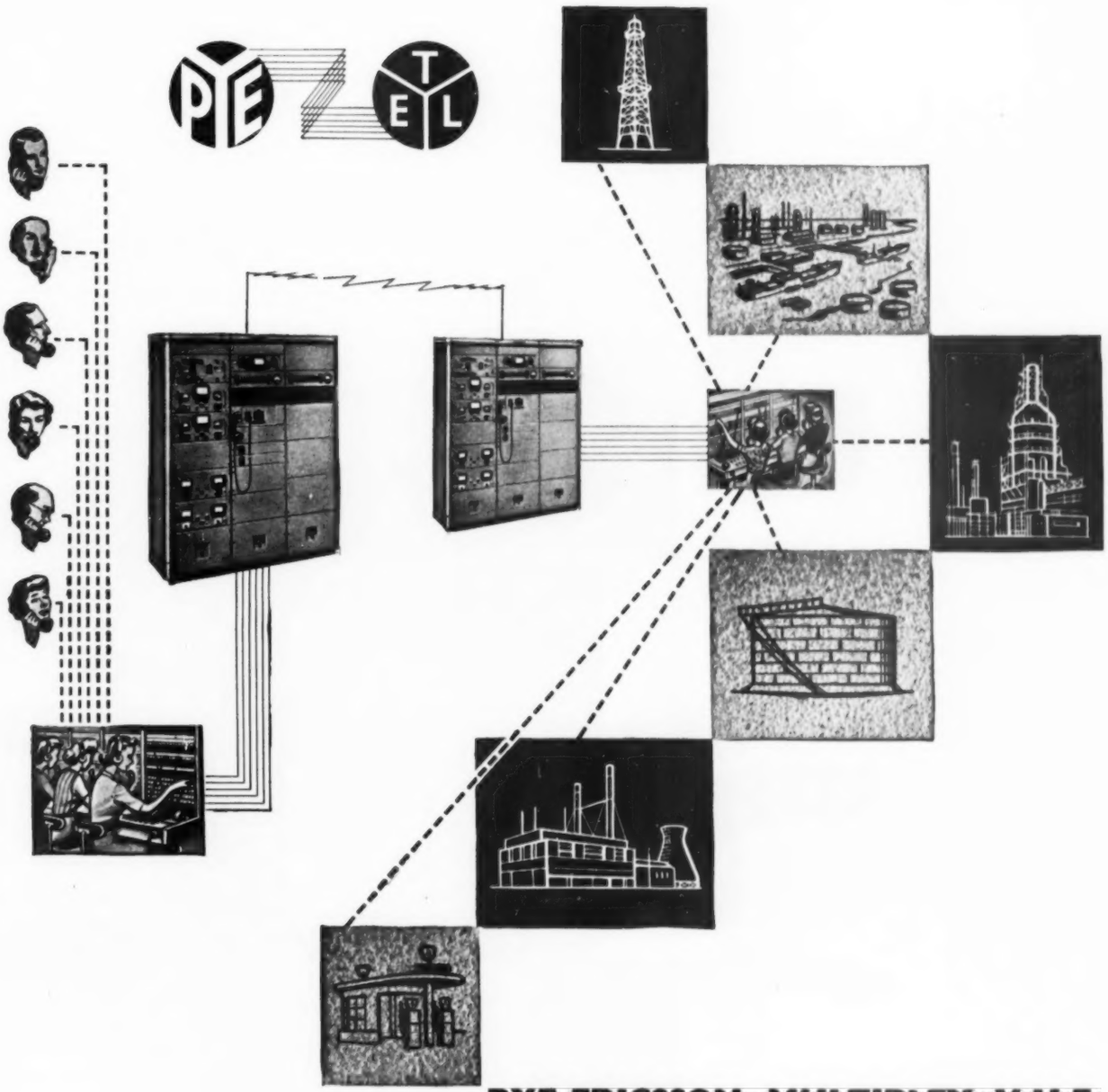

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RADIO-TELEPHONE SYSTEM

The Pye-Ericsson V.H.F. multiplex radio-telephone system is already making its contribution towards the rapid expansion of telecommunications in overseas territories. Primarily developed to give telephone communication where wire and cable circuits are impracticable or, as is more often the case, uneconomical, the multiplex system provides a link that is invulnerable to both natural hazard and pilferage.

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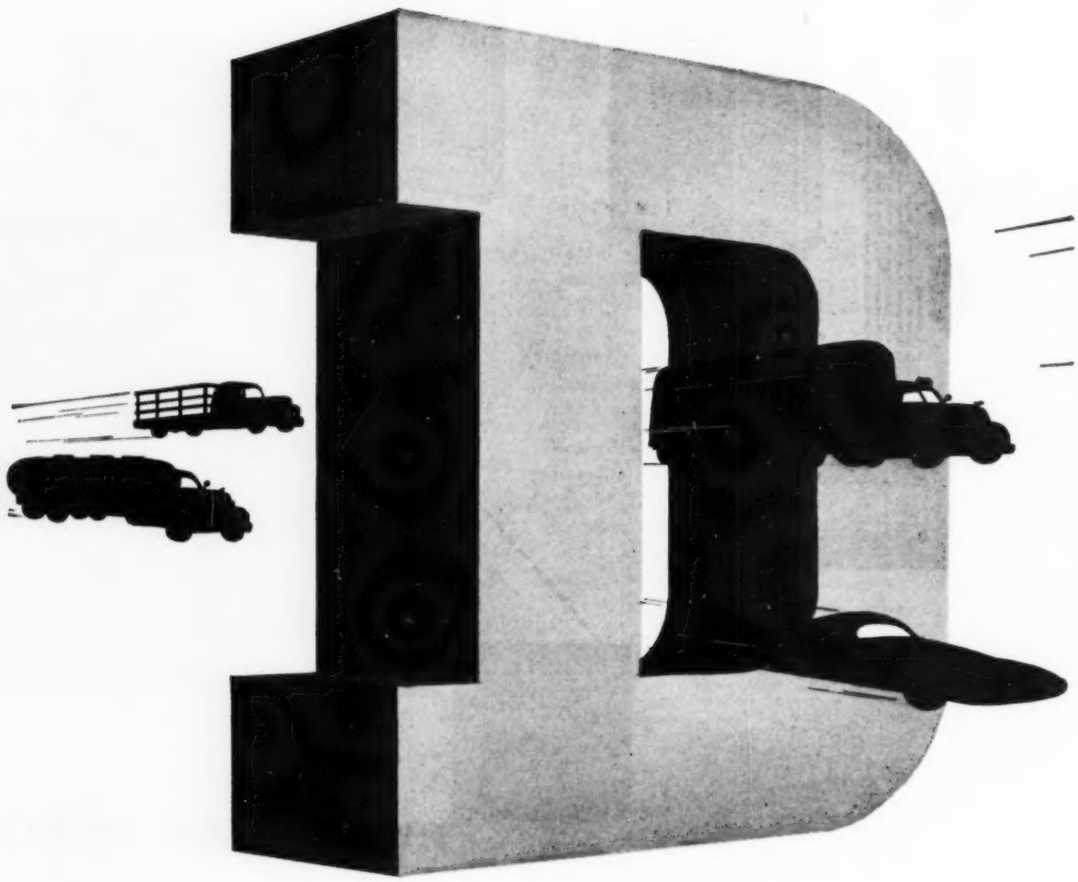

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*T.M.T.D.C.C.

Progress Through Chemistry

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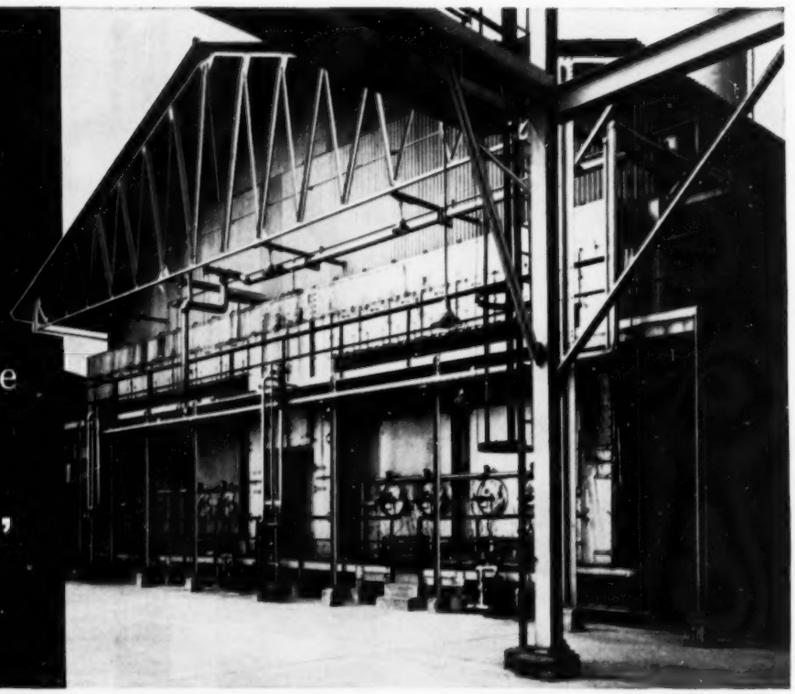
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Oil Heater Candidate For A Performance "BLUE RIBBON"



IT'S this Lummus Crude-Vacuum Oil Heater, on the job at the Paulsboro, N. J. refinery, of Socony-Vacuum Oil Company, Inc.

This unit was placed in service in November 1949. Except for a seven-day shutdown early in 1951, solely for plant considerations, ***its first run was for 3½ years.*** When the heater was opened it was found to be in good condition . . . with remarkably little maintenance necessary considering the unit's time in operation.

With a design duty of 83,000,000 Btu/hr., the heater during the last 3½ years has handled approximately 40% ***more*** than design rating. Refinery people say the heater could operate at even greater capacity.

Operating results like these at Paulsboro uphold Lummus' reputation as designers and fabricators of oil heater equipment for refineries, chemical, and petrochemical plants. In addition to superior performance, Lummus oil heater installations are marked by ease of operation and flexibility necessary to allow frequent switching of stocks.

Have we suggested a few important reasons why a Lummus Oil Heater will fit into your processing picture? We'll be pleased to have our specialists talk it over with you.

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

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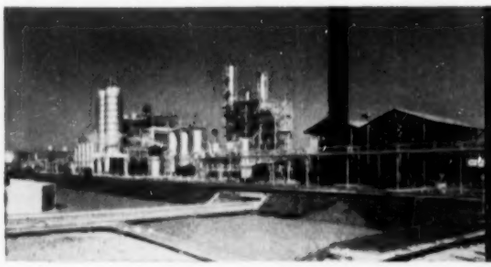

Across the Sea . . .

Shown at right in this photograph are Lummus Hot Oil Belt Heaters which satisfy by means of a circulating hot gas oil stream all heat requirements for the lube oil plant of a modern refinery at Dunkirk, France. This installation, as in the case of others similar to it, is characterized by a low initial investment since it eliminates a number of smaller heaters with their attendant engineering and erection costs.

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THIS MONTH'S COVER

Color photograph by Ulric Meisel of Dallas, Texas, of a Gulf Oil Corp. rig in southern Louisiana. Color plates are reproduced through the courtesy of Donald C. White, editor of *The Orange Disc*, Gulf's house magazine.

HALLIBURTON 204
RESEARCH
Life Preserver for Tideland Production
Pioneer tool pushers were transplanted sailors, taking land jobs in the first Pennsylvania oil fields. Right behind them came their heavy nautical equipment so easily adapted to drilling work. That's where we got our rigs, masts, logs, catheads, reels, etc. Offshore drilling now rounds out the cycle. And helping the industry get back its sea legs is Halliburton's energetic Marine Research. Since 1947, when the first cementing boat tied up to a Louisiana dock, Halliburton has devoted much effort to developing marine production improvement techniques. Today there are 14 vessels flying Halliburton's flag in the coastal canals, inland waterways, wherever wells are drilled. Such research is a life preserver for tideland production, helps recover this needed oil at lower costs.
PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES
HALLIBURTON OIL WELL CEMENTING COMPANY

PROBLEM OF IRAN'S OIL NOT INSOLUBLE

BY ITS DRAMATIC SUDDENNESS, the revolution which took place in Iran on August 19 riveted the attention of the entire world and in the minds of most persons immediately raised two questions: Was this unheralded outburst a manifestation of deep-seated feeling that would enable the new government to endure? If a stable government were established, would that lead ultimately to the restoration of Iran's once thriving oil industry?

Time alone can give the final answers to these questions. For 28 months the nation had followed, blindly it appeared, a fanatic leadership that had no policy to offer and no rallying cry except one of hatred for all foreigners. During all that time, Mohammed Mossadegh had beaten down all opposition, defied all laws, abolished every semblance of constitutional government and almost reached the pinnacle of complete dictatorship. In doing so, he had dissipated the country's reserves, ruined its industry, involved it in a debt of $200 million, emptied its treasury and left its army and civilian employees unpaid. It seemed almost incredible that a people so misled and carried to the very brink of anarchy and chaos could be halted at the final precipice and turned back to the safer but terribly difficult road leading to a sound economy.

It was the expulsion of the Shah, forced to flee as the only alternative to complete surrender and abdication, that struck a spark which blazed into action. The victory was complete, but it appeared that only the ashes of empire remained. The first and only immediate problem was one of survival, as the Shah and Premier Zahedi frankly admitted.

Response to their appeal was the prompt assurance from President Eisenhower of an emergency advance of $45 million in addition to the earlier allocation of $23.4 million for technical aid under the Point IV program.

It is obvious that these sums, generous as they are, cannot set Iran far on the road to self maintenance. Long distance plans for irrigation and other works of agricultural improvement cannot be put into effect soon enough to relieve the stark necessities of the present situation. Viewed realistically, the only hope of enabling Iran to regain a self-supporting position is through an agreement that will permit the country to derive some dependable return from its one rich and already developed resource, its petroleum deposits.

What hope there is of bringing this about is still to be determined. The desire of the United States to be of assistance was indicated by the prompt action of President Eisenhower in extending emergency aid based, as he pointed out in his letter to General Zahedi, on the latter's assurance that "it is the purpose of those now in charge of Iran to eliminate differences with other countries in a spirit of friendliness and in accordance with accepted principles of international intercourse." The British government, as a party to the dispute that precipitated Iran's difficulties, has remained discretely silent, but has approved the steps taken by the United States and undoubtedly would be willing to renew its offer to submit to fair arbitrament.

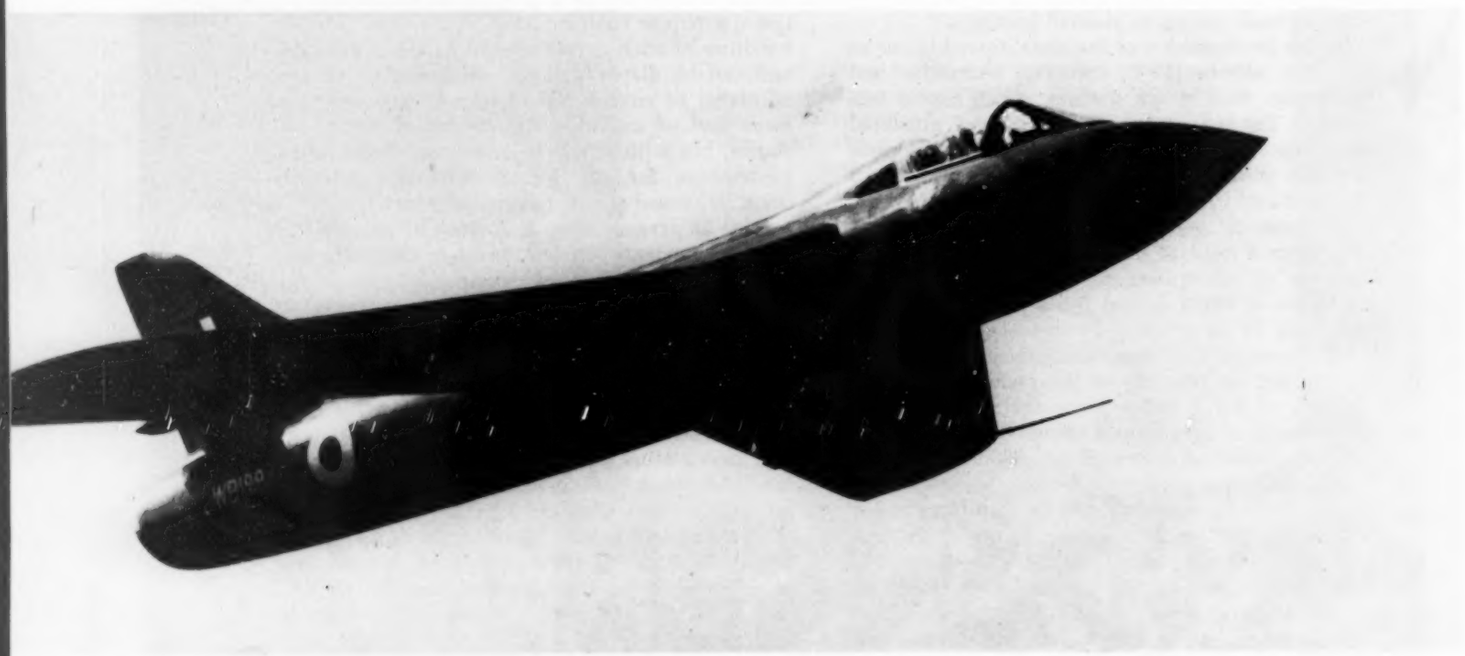
There is little that Iran can do unaided to extricate itself. Having lost its markets and without means for transporting or selling its oil, the chance of finding customers for even a tithe of its former output is slight indeed. Under the most favorable conditions, and with the whole-hearted assistance of its friends, the task of rebuilding its shattered industry will be a slow and toilsome one. Denationalization is an issue so dangerous politically that it is not likely to be raised. The most practical solution would be the organization of an international group or company that would undertake the handling of such output as can be made available and can be disposed of advantageously. A prerequisite, of course, would be an agreement for some sort of amicable adjustment of British oil claims, but with a stable government established, recompense for the seized properties probably could be spread over a number of years.

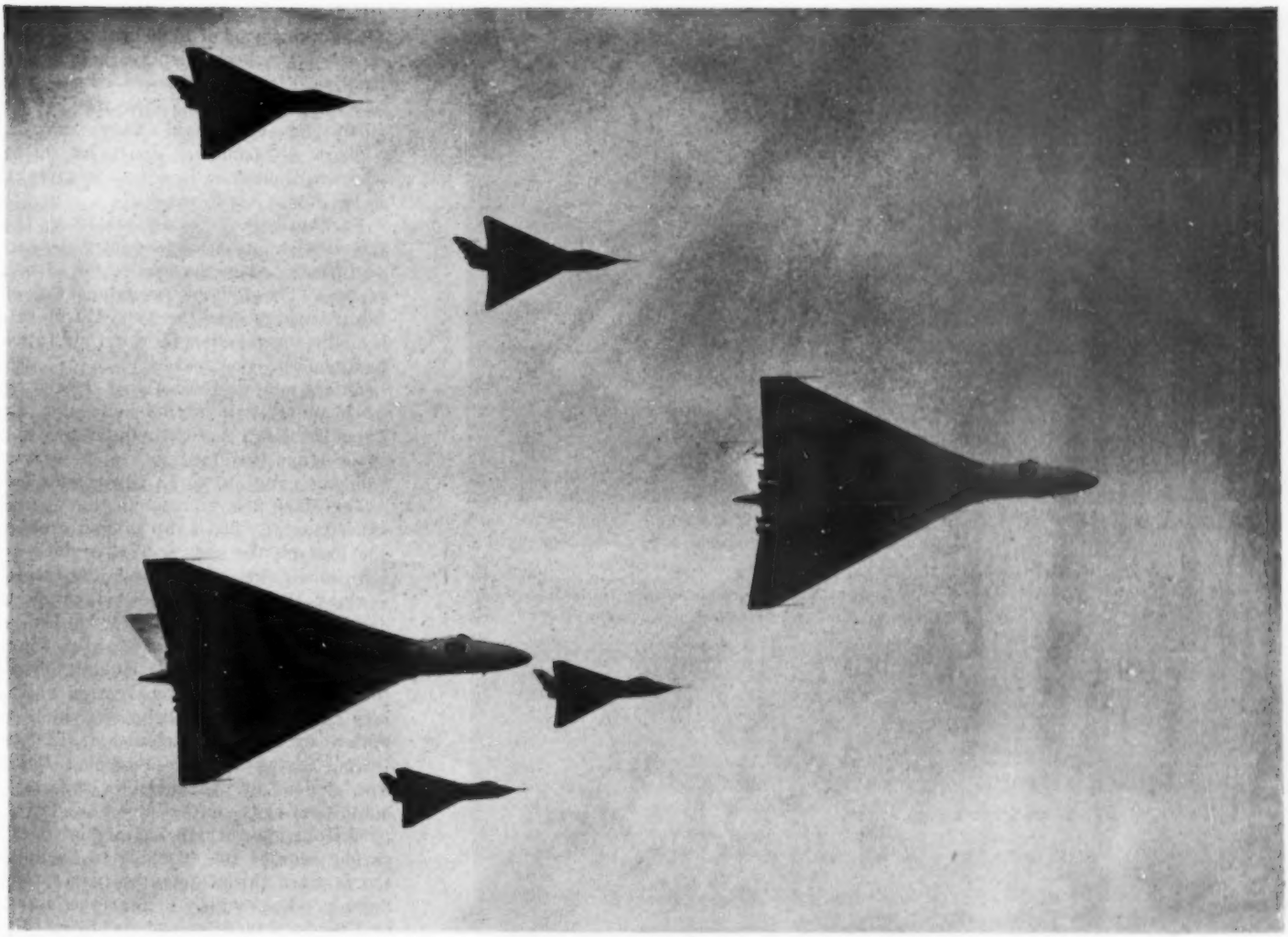
Such an arrangement, supported by powers that have demonstrated their interest in the welfare of Iran, would provide an adequate guarantee of fulfillment of whatever obligations were assumed. It would be the simplest and most beneficial that Iran can hope for. From the viewpoint of the international oil industry, it would permit the gradual restoration of Iranian oil to world commerce without dislocation of markets or the creation of opposition among other oil producing nations. After all, the total production of Iran at the peak of its activity was less than the average yearly increase in world requirements. Since such volume, if ever attainable, could be reached only by degrees over an extended period, the danger of market disorganization under intelligent management would be negligible.

Farnborough — 1953

British aircraft in review

The Hawker Hunter jet fighter in which Neville Duke recently broke the world's air speed record at 727 miles per hour.





Two Avro Vulcan delta-wing four-jet bombers flying in formation with Avro 707A, 707B and 707C ships at the Farnborough aircraft display.

REPRESENTATIVES of all nations converged on the Royal Aircraft Establishment at Farnborough, England, between September 7 and 13 to witness what has become known as the world's greatest aerial display, the Society of British Aircraft Constructors' Annual Flying Display and Exhibition.

Primarily, this is the showcase of the British aircraft industry, designed to promote the sale of Britain's stable of modern airliners and revolutionary military aircraft to foreign countries. At the same time, it gives British engineers and designers a chance to compare their products with those of their competitors, and it gives the public a feeling of pride in the British industry which gave birth to the jet age.

Observers of this year's Farnborough show could not help feel it was a letdown after the show in 1952, but as the London Times pointed out, 1952 was a vintage year. The show that year brought to public view three radically new jet bombers, three new gas turbine powered civil airliners and the gigantic Princess flying boat. It would be impossible for the industry to repeat such a performance 12 months later, and the exhibition and display this year was therefore a review, for the most part, of advanced versions of previous models.

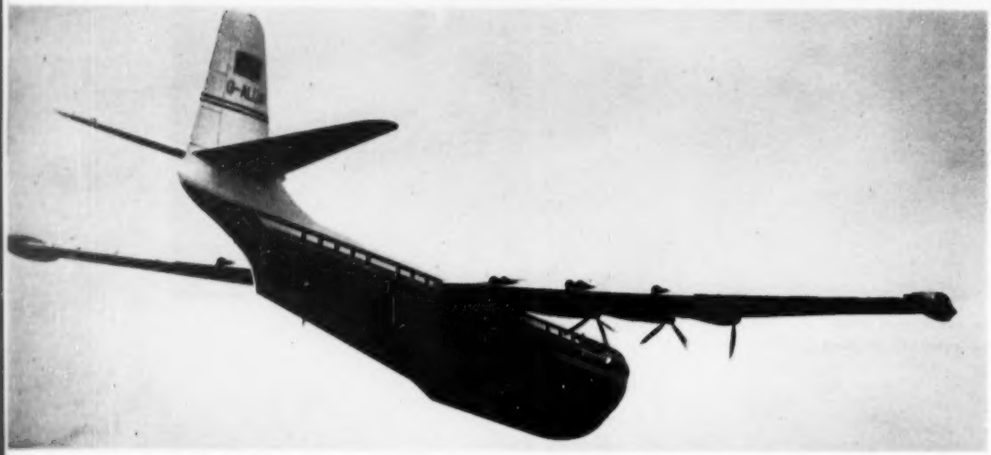
However, the Handley Page Victor, a crescent-wing jet bomber, while shown at a review earlier this year, made its first appearance at Farnborough. This aircraft is also designed so that it can be put into intercontinental airline service and Handley Page claims it will be able to cross the Atlantic three times in a day with a load of 120 people. This proposed commercial version will be powered by four Armstrong Siddeley Sapphire engines, the same engines that are being produced in the United States under license by the Wright Aeronautical Corporation for the Republic F-84 fighter and the Martin-built Canberra jet bomber. The Victor, it was announced, is in super-priority production.

Other examples of Britain's new jet bombers at the display were the delta-wing Vulcan made by A. V. Roe & Co., probably the most beautiful bomber ever built, and the Vickers Valiant, a four-jet bomber now well advanced in its super-priority production for the Royal Air Force. These bombers, incidentally, are all A-bomb carriers. Each day's show was climaxed by the mass formation flight of two Vulcans followed by the small experimental versions from which the Vulcan was evolved, two Avro 707 A's, one 707 B and a 707 C.

From the point of view of the public, the high point of the show came when Squadron Leader Neville Duke, chief test pilot for Hawker Aircraft, announced his arrival by a series of sonic bangs and then streaked across the field in his red Hawker Hunter, the same aircraft in which he won the world's speed record of 727 miles an hour for Great Britain the day the Farnborough show opened. The Hunter is a single seat, swept-wing jet fighter in super-priority production for the Royal Air Force, and also being produced through mutual assistance funds in Holland and Belgium. It has a single Rolls-Royce Avon engine with

Bristol 10-13 seat helicopter fitted with stub wings and driven by two piston engines.

The Saunders-Roe Princess, long range flying boat equipped with ten Bristol Proteus turbo-prop engines.

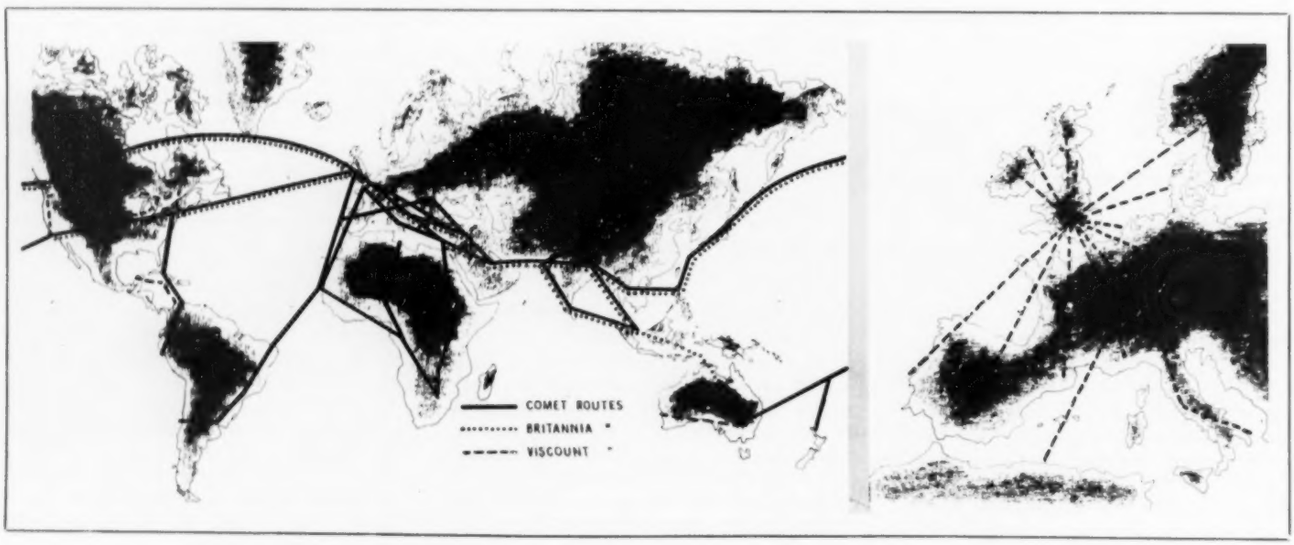


afterburner, the gross thrust being in the neighborhood of 10,000 pounds. Other military types on display included the English Electric Canberra, the Gloster Javelin, the Meteor 7, the Hawker Sea Hawk for the Royal Navy, and the Vickers Supermarine Swift jet fighter which will soon be in squadron strength in the Royal Air Force.

Farnborough also demonstarted that the British Aviation industry is seriously involved in the production of helicopters. The Bristol Aeroplane Co. exhibited two models, the Type 171 Mark 4, a single-rotor helicopter for four to five passengers, powered by one Alvis Leonides engine. Bristol also showed the world's first twin-engine helicopter, the Type 173 Mark 2 with twin rotors. This is designed for medium range service and will carry 10 to 13 passengers.

The Mark 2 is unusual in that it uses experimentally fitted sub wings to reduce the load on the rotors. The engines are 850 horsepower Alvis Leonides Major engines that permit the helicopter to carry 16 passengers at 138 miles an hour. It is apparent from the stub wings that British designers are looking toward the convertiplane, a combination of the airplane and the helicopter which is under extensive development in the United States. Further evidence of this was evident by the model in the static exhibits of the Saunders-Roe Saro Transport Helicopter which has a ducted fan on the rear of the fuselage to augment the forward thrust given by twin rotors. Saunders-Roe, which bought the rights to Ciervea's models, had on flying display the Skeeter, a two-seat helicopter with one Blackburn Cirrus Bombardier engine designed for crop dusting, police work, and light transport duty. Helicopters powered by pulsejet engines are also under development in Britain, but

Proposed turbine airliner routes up to 1957. Inset map shows scheduled Viscount routes in Europe up to 1955.



were not given permission to be shown.

When it comes to commercial transports, the Farnborough show again demonstrated that Britain has a clear lead over the rest of the world in jet transports. So busy was Vickers-Armstrong with the turbo-prop Viscount that it could not spare one of its own for demonstration purposes. The model flown was chartered from Air France which is putting them in service between Paris and Rome and Paris and London. British European Airways is using Viscounts to run services to Zurich, Milan, Rome, Athens, Cyprus and Istanbul. BEA reports that during the first 2,000 hours these aircraft were in service, they earned a net profit of over $200,000.

Withdrawn at the last minute because it was needed for flight trials was the Comet 2 which uses four 6,500-pound thrust Rolls-Royce Avon jet engines. This is a longer range version of the Comet 1 which is already in service on BOAC's routes. An even larger version, the Comet 3, seating 58 to 78 passengers, has been ordered by BOAC, Pan American World Airways and Air India. Deliveries are scheduled for 1956. Altogether, world operators have options for 100 Comet 2's and 3's in addition to firm orders already placed.

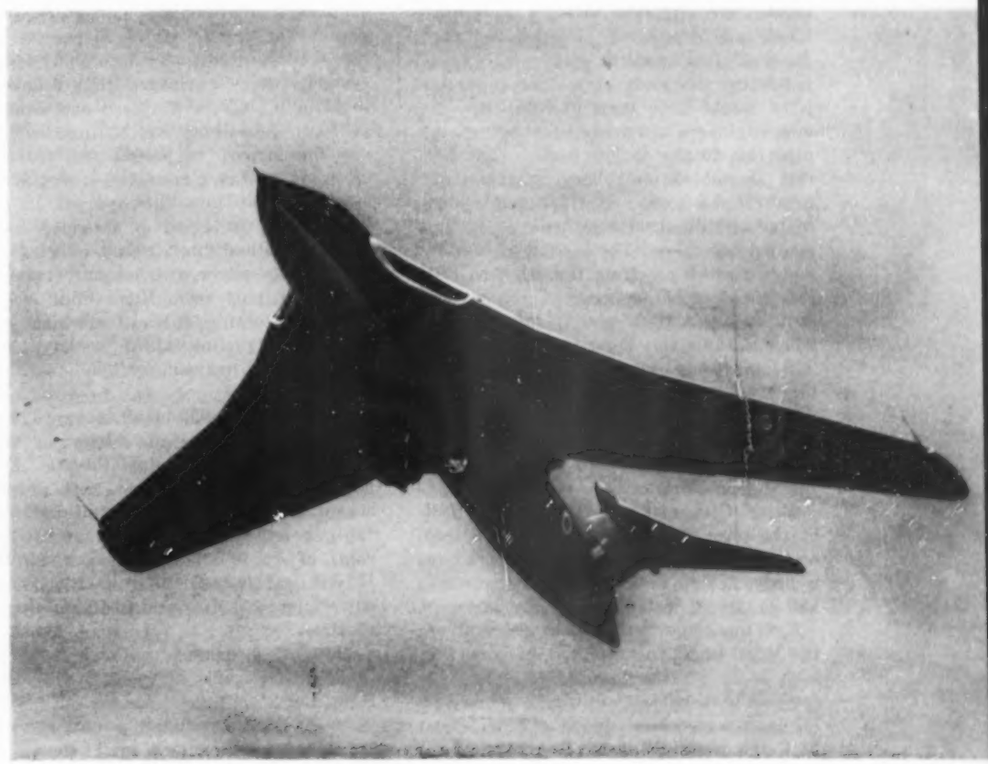
By far the greatest contribution to commercial aviation at the Farnborough show was the turbo-prop Bristol Britannia 100, the quietest airplane ever to take the air. With all the opposition throughout the world to the noise of the airplane, the Britannia presents a solution. It is a cargo airliner, seating up to 104 tourist class passengers. BOAC has ordered 35 Britannias and Quantas Empire Airways is negotiating for six. Speed of this aircraft is 360 miles an hour and its range is 3,650 statute miles.

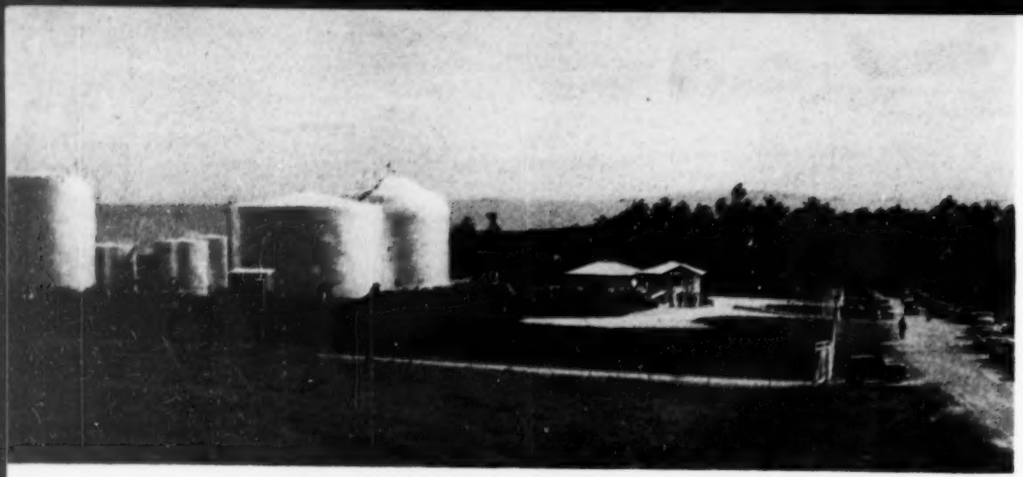
The extent to which the British expect their turbine powered transports to be operating by 1957 is shown in the accompanying map, a map that will be of interest to all those concerned with laying down supplies of fuel. This fuel is kerosine or JP-1 type, which is fairly generally available. In the future, it may be that an even heavier fuel, like diesel fuel, can be used, but at the moment there are certain problems like the high freezing point which preclude their use.

The Society of British Aircraft Constructors' show this year, while not as spectacular as last year, showed that the British industry has emerged from the prototype stage and is well into production on military and commercial aircraft of all types. With 84 Viscounts ordered and about 100 Comets soon to appear, there can be little doubt that the world's air routes will soon be familiar with the new generation of turbine-powered aircraft. The strides made by the British aviation industry present a challenge to the American aviation industry. Such competition cannot help but be of benefit to world aviation.

Folding wing of the Fairey Gannet carrier-borne anti-submarine and strike aircraft now in production for the Royal Navy. It is powered with one Armstrong Siddeley Double Mamba turbo-prop engine.

Handley-Page "crescent wing" Victor bomber fitted with four Armstrong Siddeley Sapphire jet engines. This plane is in production for the Royal Air Force. All photographs courtesy Shell Photographic Unit.





General view of tank farm storage capacity of 1,700,000 Imp. gallons. This installation serves the needs of Nadi International Airport, Fiji, and was officially opened on July 23, 1953 by His Excellency, The Governor of Fiji, Sir Ronald Garvey.

Vacuum Builds Bulk Terminal at Fiji Island Airport

VACUUM OIL Co. Pty. Ltd. recently placed in service a new bulk terminal at Vuda Point, Fiji, and a special fueling system at the nearby international airport at Nadi. The terminal and airport fueling systems, installed at a cost of £152,000, were dedicated on July 23 by Sir Roland Garvey, Governor of Fiji.

The bulk terminal, which receives products direct from ocean tankers, is built on an 11¼-acre site on high ground overlooking Vuda Point, about half way between the airport and the city of Lautoka. Eventually the terminal will be enlarged to handle motor gasoline for Lautoka as well as aviation fuels.

The terminal comprises six bulk tanks with an aggregate capacity of 50,000 barrels. Incoming products are pumped from tankers through an 8-inch submarine line. Barges are loaded in Nadi bay and tank trucks are supplied through four inch lines, one line being installed for each grade of fuel handled.

Because the cost of a long pipe line jetty would have been prohibitive, Vacuum engineers laid a 1,580-foot submarine pipe line to the tanker berth. The line was assembled on rollers on the shore in three sections. It was then tested, coated and fitted with cathodic protection against corrosion. The section of the line where it emerges from the sea was prefabricated to the contour of the ground so that it would fit exactly into position when the line was lowered to the seabed.

Supported on special drum floats, the line was towed out to sea. Final welds connecting the three sections were made and tested, and the entire pipe line was then lowered to the ocean bed by perforating the floats.

Prior to launching, the seaward end of the pipe line was fitted with 125 feet of special 8-inch flexible hose attached to a buoy, which is hauled to the surface and connected to tankers for discharge.

For moorings at the seaward end of the pipe line, Vacuum procured in the New Hebrides a set of 7.5-ton mooring anchors with cables. However, while being transported from the New Hebrides to Fiji, the moorings were lost in a shipwreck and Vacuum was faced with the task of quickly replacing them.

Using United States Navy charts as a guide for dragging operations, a set of moorings was located in the sea off Vuda Point. With the approval of the Government of Fiji, and using improvised salvage equipment, Vacuum engineers recovered sufficient anchors and cables to replace those lost.

Nadi Airport will be supplied from the Vuda Point terminal by means of a 100-ton powered barge which will be loaded by pipe line in the Vuda Point boat harbor. The Fiji Government has reconditioned the boat harbor and constructed a small loading jetty, to which product pipe lines have been connected.

Under its own power, the barge will cross Nadi Bay to the unloading jetty where its cargo will be pumped into the company's intermediate bulk storage depot on the fringe of the airport, ready for subsequent delivery into the hydrant system. It is envisaged that following construction of the proposed new runway at Nadi, pipe lines will be installed under the airport to permit the transfer of products direct from the intermediate storage depot into the hydrant "ready tanks." In the event of extended spells of bad weather interrupting barging operations, an alternative means of supplying the airport from Vuda Point would be by road tank trucks, for which purpose the refueling units rendered surplus by the hydrant system would be used.

The new £30,000 hydrant refuelling system provided at Nadi Airport by Vacuum, with the approval of the New Zealand Civil Aviation Branch, will provide a continuous supply of 100/130 and 108/135 aviation gasoline grades at refuelling rates of up to 400 gallons per minute. It will enable refuelling to be carried out efficiently, safely and in the minimum of time.

Later it is planned to add jet fuels for Comet service between Sydney and Honolulu.

The hydrant installation comprises three separate systems with a total capacity of 36,000 gallons. Each system is equipped with high-capacity pumping units, pressure regulators, etc., as well as reticulation pipe lines leading to four sets of outlet points located on either side of the refueling apron and so arranged that two large airlines can be refueled simultaneously.

From the hydrant points, the fuel is delivered into the aircraft tanks through portable equipment known as hose carts, each of which carries meters, air eliminator, flow control and pressure equipment, as well as micronic filters.

The hydrant system at Nadi also includes facilities for defueling aircraft.

Fiji has become the crossroads of the Pacific in recent years during which transoceanic aviation service has been extended from the United States to New Zealand and Australia. First Fiji refueling on a trans-Pacific flight was in 1928, when Sir Charles Kingsford Smith flew the "Southern Cross" from Oakland, Calif. to Brisbane, Australia. He made the 7,054-mile flight a quarter of a century ago in 83 hours and 11 minutes. The hop from Honolulu to Suva, Fiji of 3,138 miles was the longest leg of the historic trip and served to focus attention on Fiji as an airport site.

It was during World War II that the Nadi airport was established to serve the heavy and continuous traffic of the Allied air forces.

In 1946, Australian National Airways Pty. Ltd., operating on behalf of British Commonwealth Pacific Airlines Ltd., inaugurated the first regular trans-Pacific air service between Australia and North America, calling at Fiji. Since then other international airlines have opened up trans-Pacific services which include Fiji as a calling point. These include aircraft operated by British Commonwealth Pacific Airlines Ltd., Pan American World Airways Inc., and Canadian Pacific Airlines Ltd. In addition to these, Fiji is also served by Qantas Empire Airways, Ltd., Tasman Empire Airways Ltd., and Fiji Airways Ltd., while planes of the Royal New Zealand Air Force call at both Nadi and Suva.

Canadians upset by FPC action

TORONTO

DECISION of the Federal Power Commission in Washington to permit Tennessee Gas Transmission Company to export 22,600 million cubic feet of gas per year to Canada over a 20-year period has created a new factor in plans for supplying gas to Dominion markets and has greatly disturbed those concerned with these plans.

Announcement of the FPC decision caused an immediate action by Alberta to forestall the loss of a substantial part of the Toronto market. Trans-Canada Pipe Lines was granted a license to export Alberta gas to the eastern part of the Dominion. Alberta had been delaying a final decision, but apparently made a hurry-up decision to back up the Federal Government if it is decided to forbid importation of gas to Toronto.

Prime Minister St. Laurent told a recent press conference that the proposal to import U. S. gas falls within Canadian federal jurisdiction and that Niagara Gas Transmission line cannot be built without approval of the Board of Transport Commissioners. Trade and Commerce Minister Howe took a somewhat different view, but suggested that the question of importation would not come up "for some time yet." It has been suggested that the Export and Imports Permits Act empowers the Cabinet to issue a list by order-in-council of goods which may not be imported without a federal permit. This act expires July 31, 1954 unless it is extended by Parliament.

The FPC decision was handed down a little over five months after application for permission was filed.

In the meantime, the FPC has had before it for a much longer time the application of Westcoast Transmission Co. to export gas from Canada to the United States Pacific Northwest. There seems no likelihood that FPC will decide that case until some time in 1954.

Canada's current view seems to be that the FPC is glad to favor U.S. gas producers in finding a market across the border, but is reluctant to approve importation of foreign gas into the United States.

There has been considerable comment to the effect that the export permit to Tennessee Gas Transmission was given as a compromise to settle the New England gas controversy. Reports are that Tennessee agreed to take only part of the New England market and be quiet if it was given an outlet to Canada.

Canadian interests are disturbed by the FPC decision because they feel that loss of the Toronto market will make it uneconomic to build the proposed Trans-Canada gas line from southern Alberta and Saskatchewan fields to eastern Canadian markets. Trans-Canada had planned to lay a 30-inch line to serve Toronto, Montreal and Quebec.

There has been some discussion that Tennessee might be given permission to import gas to Canada for a short period, only until the Trans-Canada line could be put into service. This does not seem in prospect however, since Tennessee proposes to sign a firm 20-year contract with Niagara Gas Transmission, Ltd.

The intense competition for markets among various gas transmission companies both in Canada and the United States poses difficult problems for Canadian authorities. The matter now is being considered at the cabinet level to determine what course should be taken.

At the moment, Canadian observers are rather pessimistic about FPC permission to import Peace River gas to Washington and Oregon. The commission has been dawdling for more than a year since Canada gave permission to Westcoast Transmission Co. to export northern Alberta gas. United States gas producers in the four-corner area in the Rocky Mountains have been demanding the Pacific Northwest market and seeking to prevent importation of Canadian fuel. Recently FPC approved a market for four-corners gas in California and for a time this was thought to be favorable to Canadian gas for Washington and Oregon, but that hope now seems to be fading.

If Peace River gas does not find an outlet in the United States, Canadian authorities are faced with the problem of finding an outlet for the very large reserves which have been developed there. It is generally thought that the Vancouver area in British Columbia alone does not have enough potential to support the cost of building a line from Peace River. With Washington and Oregon markets, the project is feasible and, as a matter of fact, already financed.

Various interests have proposed plans to move southern Alberta gas to the east. Trans-Canada Pipe Lines has asked permission to build a 30-inch $300 million line which would follow an all-Canadian route north of Lake Superior. The line would serve a population of 4.5 million in Ontario and Quebec. It meets the Canadian government's present policy of insisting that eastern Canada be served with Canadian gas through an all-Canadian line before exports to the United States are permitted or before a line can be built south of the Great Lakes to re-enter Canada in the Sarnia area.

Trans-Canada is backed by United States interests, Delhi Corp. and Lehman Brothers, banking interests. It is opposed by some Ontario gas producers and utility interests as uneconomic. Trans-Canada counters that the line can earn good returns and deliver gas at a wholesale price of 55 cents in Toronto after paying 8.5 to 10 cents in the field.

Western Pipe Lines, another aspirant, is largely Canadian backed. It proposes to pipe gas to the twin cities, Minneapolis and St. Paul, in the United States for a five-year period and subsequently to extend its lines to eastern Canada by an all-Canadian route. This organization suggests that its plan will afford a higher field price to producers, a more immediate market, and give time for eastern markets to be developed.

Mid-Continent Pipelines Ltd. is still a third contender for the eastern market. It suggests a 2,285-mile line to the east, but following a route south of Lake Superior. It is contended that the subsidiary markets tapped in the United States would make the line more feasible than an all-Canada route and provide a higher field price to gas producers.

All of the major west-east lines are considered to be jeopardized by the plans of Consumers Gas Co. of Toronto to buy 22 billion cubic feet of gas annually from Tennessee Gas Transmission through the Niagara Gas Transmission line mentioned previously. A delivered price at the outset of 53 cents is suggested with deliveries starting in November 1954, much earlier than other projects to deliver western Canada gas.

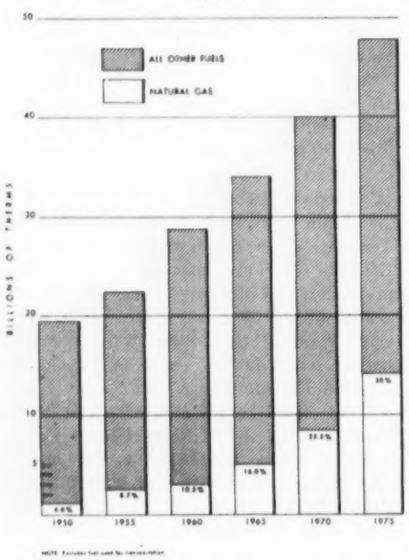
There has been some speculation in Canada since the FPC decision was announced as to whether the government may prevent importation of United States gas to Toronto, at least for the present, until a national fuels policy can be hammered out. Adoption of such a policy would require close consultation with the various provincial governments. Thus far the provincial authorities have considered gas import and export problems independently.

From the standpoint of oil producers, some settlement of the gas marketing problem is highly desirable because of the effect which lack of markets has on wildcatting. In 1952 a total of 254 new oil and gas fields was discovered in Canada, according to data gathered by a committee of the American Association of Petroleum Geologists. Of the new discoveries, 150 were oil and 104 were gas or condensate. With 40 percent of new discoveries gas wells (which must be capped until markets are developed), the urge to drill is materially lessened. Recent reports indicate that drilling is off about 12 percent in Canada compared with last year. This is despite the fact that crude production has been running at the highest level in Canadian history and is nearing MER. With the Trans Mountain crude line to the Pacific Coast to be completed this month and the Interprovincial extension to Sarnia not far behind, it is apparent that demand for western crude will continue to rise. To find new oil in Canada some outlet for gas is needed as an added stimulus.

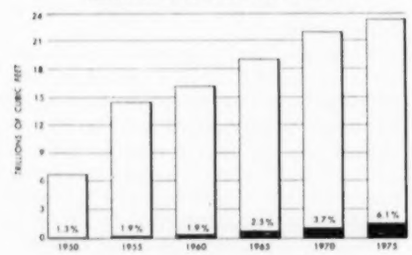
Canadian-U. S. research team reports on natural gas situation

ESTIMATED CANADIAN ENERGY CONSUMPTION

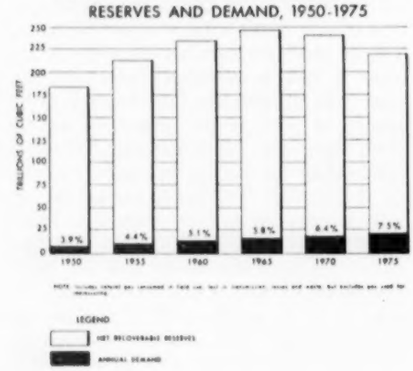
1950 – 1975



ESTIMATED CANADIAN NATURAL GAS RESERVES AND DEMAND, 1950-1975



ESTIMATED UNITED STATES NATURAL GAS RESERVES AND DEMAND, 1950-1975



RAPID RISE in the consumption of natural gas based on its demonstrated advantages as a fuel of high efficiency has posed a problem of primary importance wherever this form of liquid fuel is available.

In the United States such fuels, oil and gas, surpassed coal as a source of the nation's supply of thermal energy as far back as 1948, and today are calculated to provide 65 percent of the total energy consumed. Of the liquid fuel marketed, the proportionate share of natural gas increased from 28 to 36 percent between 1945 and 1951 and now is estimated at more than 40 percent. Considering that the range of distribution of gas is limited to markets with which it can be connected by pipe lines from areas of production, this is convincing evidence of its strong appeal both for domestic heating and for industrial use.

Natural gas reserves of the United States at the end of 1952 were estimated at 199.7 trillion cubic feet. During the past several years, known reserves had been increasing at the rate of about 13.8 trillion feet annually. Additions during 1952 amounted to 14.5 trillion feet and withdrawals were 8.6 trillion, leaving a net gain of 5.9 trillion.

If the discovery of new reserves can maintain its present lead over consumption, it is calculated the total volume of United States reserves will rise to 237.5 trillion feet by 1965, beyond which point they may be expected to decline.

While the discovery and development of natural gas in the United States is in the hands of individuals or companies, the management and utilization of this vast national resource is under control of a government agency, the Federal Power Commission. Without authorization from this body, no interstate gas line can be built and its members can determine which of several applicants shall be allowed to serve a specified market area. The FPC likewise fixes the rules and regulations under which companies shall operate and holds the decision whether gas may be exported or imported. Thus the federal government, through its legalized agency, has the authority and responsibility of fixing national policy in regard to the future of this vast and growing industry, can exercise the power of life or death over individual projects and can decree industrial progress or stagnation to various sections of the country.

At the moment, the question of commanding interest before the commission is the one of import and export. Because of the rapid growth of Canada's oil and gas industry, the certainty of its vast future expansion and its almost limitless potentialities, proposals have been made that the surplus gas reserves of the Dominion beyond its own requirements be tapped to supply certain sections of the United States so situated that they can be economically served from across the country's northern border. This is a question, of course, that can be answered affirmatively only by agreement of both governments, because gas produced in Canada can be shipped outside only by permission of Provincial and Dominion authorities. These officials naturally are keenly interested in seeing to it that any export of oil or gas shall not be at the expense of full future development of their own industries and have taken the position that no export shall be permitted until known reserves are sufficient to supply estimated local requirements for at least 20 years. Extensive discoveries within the past two years, however, appear to have demonstrated that this requirement has been satisfied and that there is no physical obstacle to supplying certain markets below the border from producing districts in Canada so located that they can serve these areas advantageously.

From an economic viewpoint, it would appear to be to the advantage of both nations to undertake an interchange of commodities, both oil and gas, on the basis of present convenience and due consideration for the future development of both. Politically, the relations between the two are such that no future complications on this score are envisaged. However, the ambitions of various business groups have brought before the Federal Power Commission a number of proposals for shipment of gas across the border from north to south or vice versa and some of these conflict as to the areas they seek to serve. The commission is now engaged in studying these proposals and is not expected to reach a final decision for several months to come.

With a view to providing an impartial

survey of the problem of the most economical way of supplying natural gas to Canadian markets, Imperial Oil Ltd. arranged late last year for a study of the matter purely from the economic viewpoint by a research team selected by the School of Business Administration of the University of Western Ontario and the Stanford Research Institute of Stanford University in California. While the study is entitled "Economics of Supplying Natural Gas to the Ontario and Quebec markets," the report, completed last March, includes a comparison of several projects for marketing Canadian gas with proposals for serving the same markets with gas from the United States.

In estimating markets for natural gas, the report takes account of three basic demand segments: base load, space heating load and industrial, pointing out that these may be further divided into residential, commercial, firm industrial and interruptible industrial demands. In applying these factors to the markets of eastern Canada, the report comments in part as follows:

"The average consumer price for natural gas in the eastern Canadian market area is estimated to be $1.10 per mcf for the residential, commercial, and firm industrial demand segments. The estimated average price for the interruptible industrial market is 40 cents per mcf. The weighted average price is $1.01 per mcf.

"The present cost of manufactured gas for use by commercial and industrial establishments in eastern Canada varies from $1.75 to $2.50 per mcf of natural gas equivalent. A natural gas price in the range of $1.10 per mcf is expected to increase the demand for gas by commercial and industrial customers to 24 billion cubic feet in the fifth year of pipe line operation.

"It is estimated that natural gas sales for the fifth full year of operation of a pipe line serving major eastern Canadian cities and adjacent territories will be 87 billion cubic feet, excluding pipe line and utility systems losses, which amount to four billion cubic feet. Of this, 76 billion are anticipated as firm sales and 11 billion as interruptible sales."

The figure of 87 billion does not include an estimated distribution of 14½ billion cubic feet now being made by companies supplying natural gas from local sources or from United States imports. The effect of price in relation to competitive fuels upon potential demand is indicated by charts accompanying the report.

The proposed pipe line systems considered in the report are five in number. In the case of one of these, designed to serve markets in Eastern Canada, alternative routes are compared, one lying entirely in Canada and the other extending for part of its course through the northern United States, although not selling any part of its product in this country. Construction cost of a line that would pass south of Lake Superior and through Michigan before re-entering Canada, following generally the route of the Interprovincial oil line, would be somewhat less difficult and expensive than one laid through the rugged terrain north of Superior. On the other hand, sentiment in the Dominion appears to favor an all-Canada system connecting west and east. Proponent of this undertaking to connect the gas production of southern Alberta with the industrial areas of Ontario and Quebec is Trans Canada Pipe Lines Ltd., which plans a line 2,700 miles in length with pipe of 30-inch diameter and a capacity of 34.7 million cubic feet of gas per day. Its cost is estimated at $280 million.

Western Pipe Lines proposes a line from southern Alberta to Winnipeg, Manitoba, and thence to the international boundary, a distance of 833 miles. Its pipe would be of 24-inch diameter and its capacity would be 264 million cubic feet per day. The cost would be $71.5 million. According to plan, part of the gas transported by this system would be sold in and around Winnipeg and the remainder would be delivered at the international border to Northern Natural Gas Co. of Omaha for distribution in Minnesota.

Niagara Gas Transmission Co. Ltd. applied for permission to build a line 80 miles long between the cities of Buffalo, New York, and Toronto, Canada. The diameter of the line is to be 30 inches, its capacity 112 million cubic feet daily and its cost $7.1 million. The objective is to supply gas brought from the Gulf Coast area through the system of the Tennessee Gas Transmission Co. for use in the province of Ontario. This particular project received the sanction of the Federal Power Commission at the end of August, so the building of the line appears to be a certainty if the project is acceptable to Dominion authorities.

These projects are not competitive and their execution will depend presumably upon decision as to the availability of adequate supplies of gas and upon the requirements of the markets to be served. In one direction, however, strong rivalry has developed. At issue is determination of the question as to who shall supply natural gas to the northwestern section of the United States, an area destined for a great industrial development which already is under way. Two strong and ably-backed companies are seeking authorization to serve this promising territory, and the decision between them not only imposes an unusual responsibility on the Federal Power Commission, but has become a matter of international concern.

On the one side is the Westcoast Transmission Co. Ltd., a Canadian corporation which is proposing a 1,200-mile pipe line to transport gas from northern Alberta and British Columbia to the southern area of the Pacific Coast province and to the states of Washington and Oregon. Its plans, for the purposes of the economic report which seeks to put the various proposals on a comparable basis, call for a 30-inch diameter line with a capacity of 310 million cubic feet daily. Construction of the line requires an investment estimated at $152 million.

Looking to the United States section of the same marketing territory is the Pacific Northwest Pipe Line Corp., organized by Texas capitalists, which proposes construction of a 30-inch line 1,600 miles long with a daily capacity of 300 million cubic feet per day. The company would draw its supply of gas from the San Juan Basin of northern New Mexico. Cost of the line is figured at $175 million.

The line dimensions listed above are those adopted by the research team in order to arrive at a comparison of the relative economic position of the projected lines. Since they are not the same as those set forth in the proposals submitted by the companies in their original applications, they also affect stated capitalization and operating costs, but are considered fairer as a basis of comparison since the purpose of the investigation was only to determine on a broad scale the most advantageous way of utilizing available sources of supply with a view to meeting future requirements of the areas to be served.

Included in the report is a tabulation of cost estimates for the proposed lines comparing the basic factors adopted for purposes of the study with those used by the companies themselves. These particulars are set forth in the accompanying tabulation (Table I), page 86.

Another comparison of capacities and operating costs included in the report

(Please turn to page 86)

Refiners well prepared to supply record distillate fuel demand

Diesels are taking over much of the heavy over-the-road hauling of the nation as well as supplying power for off-highway equipment. Shown is a 200 hp Cummins diesel pulling a trailer in the mountains near Salt Lake City. Photo courtesy DIESEL PROGRESS *magazine.*

RECENTLY an oil industry economist who has spent some 30-odd years poring over his slide rule was moved to comment on prospects for distillate demand during the coming heating season.

"I feel it in my bones that we are going to have a cold winter," he said.

Thus the aging bones of the economist are called on to supplement the woolly-bear worms and the pelts of the squirrels as aids to the oil industry in forecasting gallonage. Perhaps, also, the law of probabilities, another fancy implement of the forecaster, can be employed to suggest that the 1953-1954 heating season may impose heavier demands than those of recent years. For, despite the warming trend of the United States, which has been observable for a hundred years or more, a series of mild winters has in the past been followed by a cold one. Nobody, however, has been able to work out a mathematically exact formula for the cycle.

Four of the past five winter seasons in the United States have been relatively warm. In the 1952-53 season, the average degree days in 18 cities on the Atlantic seaboard totaled 4,375 compared with a normal of 4,950. The degree-day accumulation was 11.6 percent below normal and 6.4 percent below the mild 1950-51 winter.

In the Middle West, a representative average degree-day total was 5,355 compared with a 5,736 degree-day normal. The average was 6.6 percent below normal and 10.7 percent below the 1950-51 record.

Combining the two, it will be observed

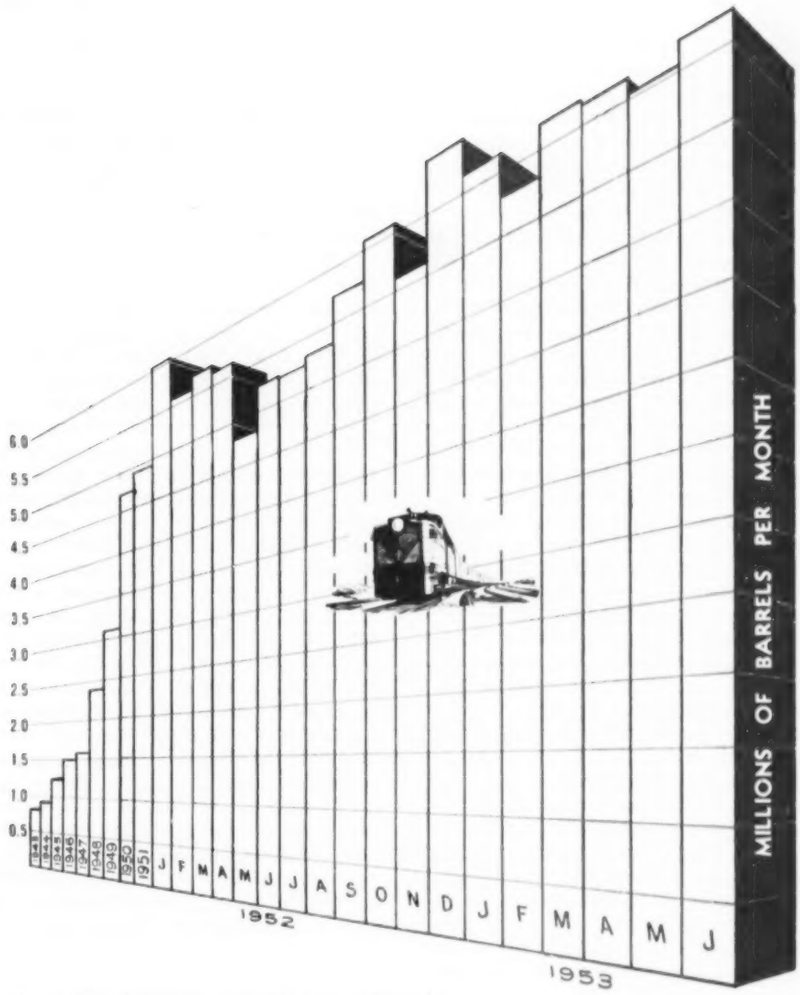
that the 1952-53 heating season was 9.5 percent warmer than normal and 8.4 percent warmer than the previous year.

Furnace oil demand does not correspond exactly to the weather, partly because of the greater efficiency of new units now being sold and the rising trend in the use of insulation, but the relationship is fairly close. *Fuel Oil and Oil Heat* magazine has calculated average consumption per home burner of No. 2 fuel oil in 1952 at 1,505 gallons compared with 1,638 gallons the year before. The drop was 8.83 percent compared with an 8.4 percent decrease in degree days.

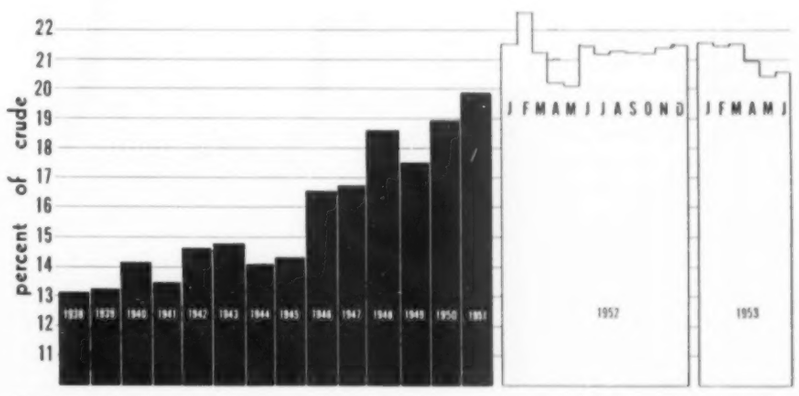
Ignoring the influence of greater efficiency and wider use of insulation, it can be estimated that had last winter been normal, the oil refining industry would have been called on to supply about 143 more gallons to each of 6,345,000 burners, a mere matter of 21,600,000 barrels. Had the average temperatures swung over to 9.5 percent below normal, the demand increase would have approximated 43 million barrels.

Refinery stocks of distillate fuels at the end of the season last March totaled 59.8 million barrels. Secondary stocks totaled 13.9 million barrels on the same date, a total of 73.7 million barrels.

Considering the necessity of maintaining minimum working stocks and the impossibility in a free economy of a perfect distribution of products, it is obvious that a 10 percent below normal winter season can well create a great deal of trouble in the present advanced stages of develop-



U. S. railroads now are consuming more than six million barrels of diesel fuel per month although the rate of increase is tending to be less abrupt.



After a steady increase for many years, the refinery yield of middle distillates has been relatively steady in 1953 as a result of the warm heating season.

ment of the home heating market in the United States.

Each year the market becomes inexorably larger despite the rapid growth of natural gas distributing systems and the efforts of the coal interests to stay the expansion of liquid fuels. In 1952, for example, 641,320 new oil burners were installed in United States homes according to *Fuel Oil and Oil Heat*. Total in use at the end of the year was 6,345,876. Net increase was 11.2 percent.

In the first seven months of this year 315,259 new burners were installed compared with 308,637 in the same months of 1952. There is no reason at this time to suppose that sales will not approximate 790,000 this year. The net increase in burners in use probably will be about 650,000 after allowing for the loss of perhaps 40,000 installations to competing fuels and the replacement of 100,000 worn out or obsolete burners with new or improved models.

With no change in weather conditions to affect the average No. 2 fuel oil consumption of nearly 36 barrels per burner, the American market is growing at the rate of about 23 million barrels per year. As pointed out above, the weather man could add double that amount to No. 2 fuel requirements, lifting the increase to perhaps 65 million barrels in a single year. The very rapid current expansion in the diesel fuel market would tend to complicate matters still further.

Despite the feeling in the bones of our economist friend, nobody seems to be worried at this stage of the game.

Most fuel oil dealers are not pushing summer discount fills except to the extent that competition requires. They feel that summer discounts do little or no good in moving stocks into consumer storage. Permissive "keep full" customers are much more highly valued.

Consumer storage at an average of about 10 barrels per home is about 65 million barrels. This capacity is normally more than 60 percent filled in the late summer. In addition, secondary storage tankage assigned to distillate and diesel fuels by distributors totals about 30 million barrels.

Secondary stocks of distillate fuels are only slightly higher than a year ago. On June 30, secondary stocks on the Atlantic seaboard totaled 7,953,000 barrels compared with 7,382,000 barrels on the same date a year ago, according to a Census Bureau survey. The increase was 571,000 barrels or 7.7 percent. In the Middle West, secondary stocks totaled 4,347,000 barrels compared with 4,608,000 barrels a year ago, a drop of 261,000 barrels. West Coast stocks were about the same as of June 30, 1952. Total U. S. secondary tankage was about half full.

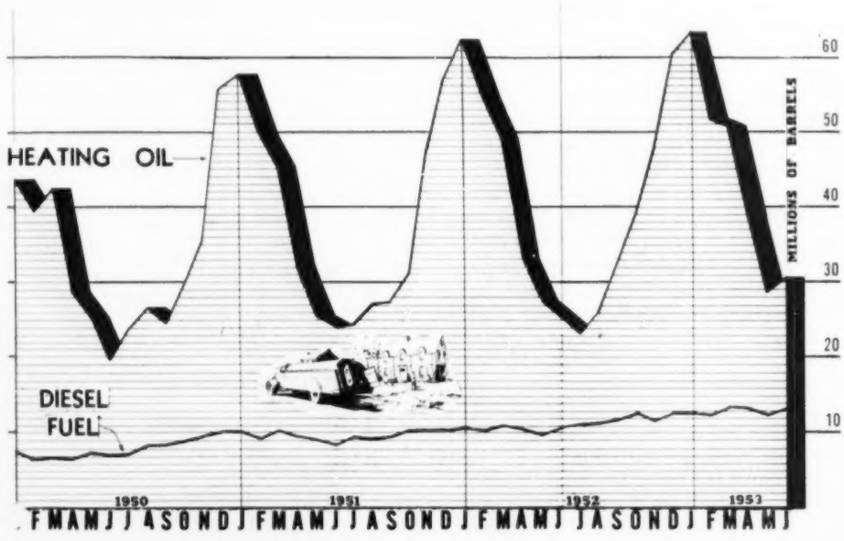
The urge to build reserve stocks of furnace oils has been greatest on the Atlantic seaboard since the days of World War II, when submarines were taking a daily toll of coastal shipping. The post-war shortage of tankers contributed to the desire for more security again in the cold winter of 1947-1948 when consumers were confronted with a near-shortage. The Middle West is so much nearer to oil supplies that fear of shortage has much less effect. Most recent Census Bureau figures showed East Coast tankage 53 percent full and Middle West storage 38 percent full. Since the report is as of June 30, it does not have too much meaning at the beginning of October.

Refinery stock figures are much more current than secondary storage reports because of the weekly reports compiled by the American Petroleum Institute. As this is written, figures are complete to the beginning of September. Primary stock figures this year now are running about 14 percent ahead of last year. At the end of July, distillate and gas oil inventories stood at 102.6 million barrels compared with 86 million barrels in 1952. August accumulations in both years have been at the rate of about four million barrels per week. The total on August 29 was 116.6 million barrels compared with 102.3 million barrels on August 30, 1952. If a normal build-up pattern is followed, it is probable that the peak late in October will be about 135 million barrels. With about 25 million barrels of distillate in secondary storage and possibly 40 million barrels in the hands of consumers, there will be an immediate supply of 200 million barrels on hand when the heating season gets under way. Not all of this will be No. 2 fuel. A substantial volume will be diesel fuel and gas oil. Nevertheless, the industry can consider itself in a comfortable position when stocks of all categories are equal to something like 70 to 80 percent of the season's probable demand.

Little mention has been made thus far in this review of the diesel fuel demand which each year becomes a more important segment of the market for middle distillates. In 1951, diesel engines burned 116 million barrels of middle distillates, nearly 26 percent of total domestic demand. In 1952, diesel fuel demand increased 16 percent to 134,790,000 barrels, representing 28 percent of middle distillate demand.

There are indications that the recent rapid rise in the diesel fuel demand curve is being moderated. In the first six months of this year refinery shipments of diesel fuel were 21 percent greater than in the first half of 1952, but only 8.6 percent ahead of the last six months of 1952.

Dieselization of American railroads is nearing completion and this in itself will have a profound effect on the rate of rise in future diesel fuel demand. Each mainline railroad locomotive consumes about 5,000 barrels of diesel fuel per year so that as long as the number of new locomotives being put into service was jumping at the rate of 200 per month or more, as was the case recently, there was a correspondingly rapid increase in railroad diesel fuel consumption. In 1951, diesel locomotives consumed 24.4 percent more diesel fuel than in 1950, and last year's demand was up another 15.7 percent. In the six months ended June 30 of this year,


HEATING OIL
DIESEL FUEL
60
50
40
30
20
10
MILLIONS OF BARRELS
1950
1951
1952
1953
F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J

Comparison of the steady demand for diesel fuel with the wide seasonal fluctuations in refinery shipments of furnace oil.

the increase was only 11.2 percent over the same period last year.

In 1951 and 1952, railroads consumed half of the nation's supply of diesel fuel. This year the proportion has dropped to about 48 percent.

Some estimate of the future rate of increase in railroad diesel fuel demand may be made from the relative number of locomotives on order last August 1 compared with the same date in 1952 and 1951 as indicated in the following tabulation:

DIESEL LOCOMOTIVES ON ORDER

Type	*Aug. 1, 1953*	*Aug. 1, 1952*	*Aug. 1, 1951*
Passenger	62	105	114
Freight	170	744	635
Pass. or Ft.	8	68	74
Switch	244	512	765
Total	484	1,429	1,588

In addition to the diesels indicated in the tabulation, American railroads had five gas turbine-electric locomotives on order a year ago and 17 on order on August 1, 1953.

Within the past 12 months railroads have added 2,032 diesel locomotives to the fleet, bringing the August 1 total to 15,810. The total does not include eight gas turbine-electric units. Details of the fleet are shown below:

DIESEL LOCOMOTIVES IN USE AUGUST 1, 1953

Type	*No. of Locomotives*	*No. Units*
Passenger	1,371	2,263
Freight	5,358	10,361
Pass. or Ft.	799	990
Switch	8,282	8,377
Total	15,810	21,991

The fleet of steam locomotives has been declining as the diesel fleet expanded. No new steam locomotives are being ordered by the carriers. A year ago diesel locomotives in use were capable of producing 53 percent of the tractive effort, and this year the percentage has risen to 58. Steam stood at 49 percent in 1952 and dropped further to 36 percent this year. Power analysis of the fleet is given below:

TRACTIVE EFFORT OF LOCOMOTIVES IN SERVICE
(Thousands of Pounds)

	Aug. 1, 1953	*Aug. 1, 1952*
Diesel	1,306,995	1,145,417
Steam	805,579	1,053,764
Electric	42,935	45,264
Gas Turbine	1,104	690
Total	2,156,613	2,245,135

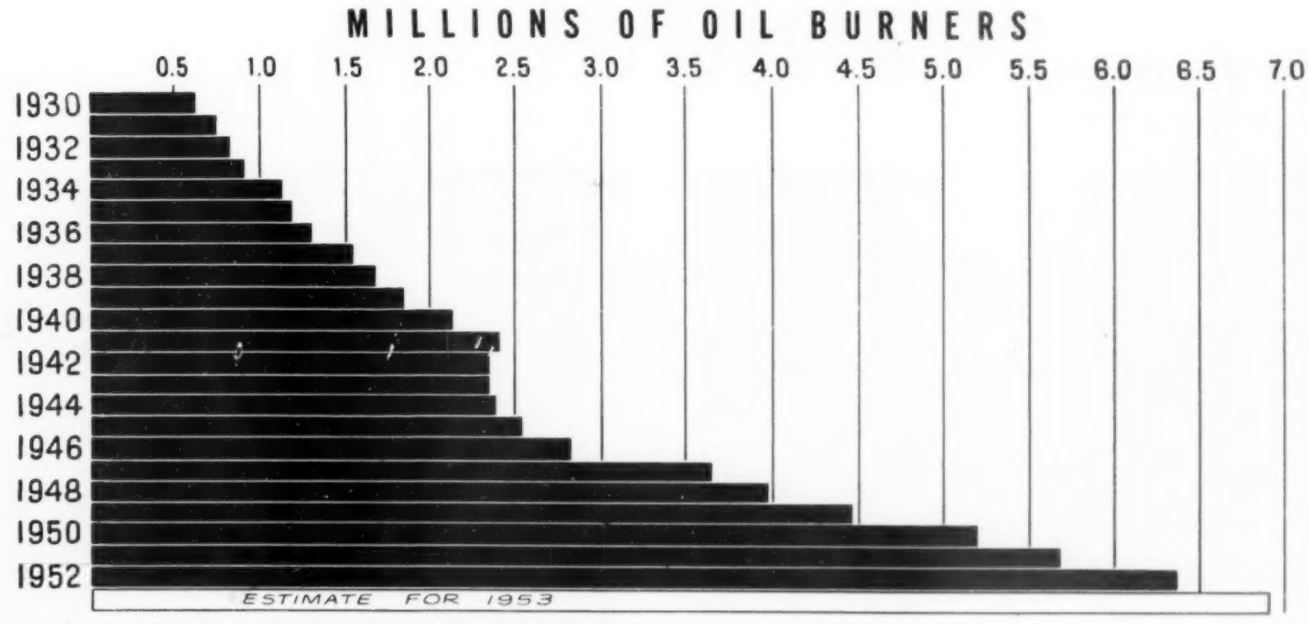
Growth of the gas turbine as a possible competitor of the diesel locomotive is an interesting development of the past two years. While these units, which are confined to the Union Pacific lines at this time, have tried heavy fuels, it is understood that lighter oils are preferred. One locomotive has had trials with propane, but in general it is thought that middle distillates will be the final fuel, thus making them a competitor of diesels for the heart cut out of the barrel of crude.

Diesel Progress magazine estimates that in the 12 months ended next June 30, the diesel engine manufacturing industry will deliver 138,000 engines with an aggregate horsepower of 25 million. Trucks and buses will take 13 percent of the output, farm machinery 15 percent and contractors' equipment and tractors 30 percent. Railroads will buy only 2.3 percent of the total number of units. Horsepower of the individual railroad engine is of course greater. A new element in the diesel field is the small 5-10 hp air-cooled diesel. *Diesel Progress* suggests that as many as 50,000 of these may be manufactured within the next year.

With 25 million new horsepower per year being added to the diesel fuel market, it is indeed fortunate that the seasonal factor is not severe as in the case of furnace oil. There is as little variation in refinery shipments of diesel from month to month as any other product of petroleum.

To meet the expanding market, refiners continued to increase their yield of middle distillates during the past year at about the rate observed since the war. As indicated in an accompanying chart, yields have risen from 16.62 percent of crude in 1947 to 18.98 in 1950, to 19.97 in 1951 and 21.3 percent in 1952. The warm 1952-53 heating season has made it unnecessary for the industry to increase this year's yield. Refiners are, however, preparing to continue the post-war trend by the installation of greater numbers of coking stills.

For the coming peak season, refiners have built a comfortable stock of products at refineries and bulk terminals and have at their command the possibility of increasing their yields beyond present levels. Adequate transportation is available to deliver the product to market. So whether it be a warm or a severe winter there is an understandable lack of concern in the industry.



By the end of 1953 it is estimated that there will be about 6,990,000 oil burners in use in the United States.

Colombia extending pipe line systems

THE SECOND STEP soon will be completed in Colombia's five-part pipe line program designed to deliver petroleum products to major centers of population and areas of greatest consumption. The new line parallels the Magdalena River from Cantimplora to Puerto Salgar where it delivers gasoline, kerosine and diesel fuel to the Bogota line.

Williams Brothers Overseas Company Ltd. is builder of this new line and of the Puerto Salgar-Bogota project which went into service a year ago, lifting products up some 8,000 feet to the lofty plateau on which the nation's capital city is built.

Distribution of petroleum products in Colombia has been hampered by rugged terrain. Three great mountain ranges, the Cordilleros Occidental, Central and Oriental, hamper communication between different parts of the country. Railroads and motor roads across the mountains are overburdened and difficult to maintain in the face of torrential tropical rains at certain seasons of the year. Interrupted communications have made rationing necessary and have retarded development of the national economy. Most feasible method of supplying many areas has been to export crude from the Magdalena Valley, process it in foreign refineries, and reimport products.

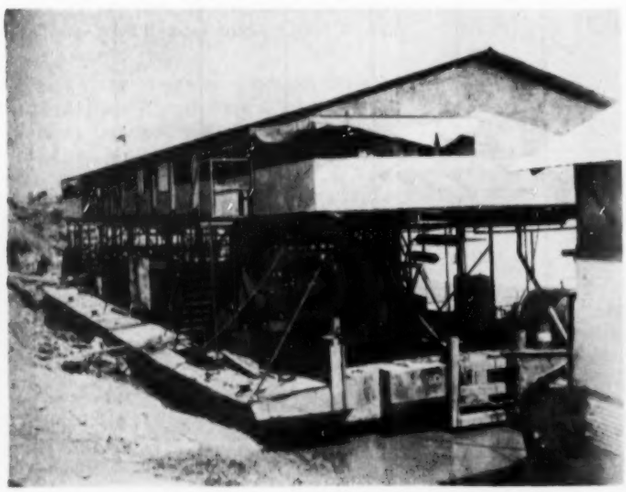
Completion of the first two units in the proposed system would free the Bogota area of dependence on uncertain rail and motor transport. Supplies are pumped over the 9,000-foot escarpment of the plateau in rainy as well as dry seasons.

In the second half of 1952 the Bogota line delivered 27,854,000 gallons of products. This year the pumping rate is averaging about five million gallons monthly. Operation of the line is one factor in the growth in national consumption. In 1952 Colombia consumed 355 million gallons of principal oil products compared with 314 million gallons the previous year. The increase of 13.2 percent was far greater than the average rate of increase in Latin America.

Next step in the national program is expected to be the rebuilding of an unsatisfactory line from Puerto Berrio to Medellin. This line was laid earlier on the railroad right-of-way, in many places on the crossties themselves. Pipe employed was thin walled tubing. The railroad along which the line was laid is sharply curved and traverses steep grades, with the result that derailments are frequent. Every train carries jacks to enable the regular crew to restore cars to the rails.

Derailments often damage the pipe line so that it proved unfeasible to operate. Williams Brothers was employed by the Antioquia Department government to make an engineering report on how the project should be rebuilt and a study of the route to determine how much of the pipe must be relocated to eliminate the danger of accidental break-

River boat used by Williams Bros. as operating headquarters during construction of Cantimplora-Puerto Salgar pipe line.



Rough going in the swampy right-of-way along the Magdalena River.

age by the railroad. This report is being prepared and will be studied by Department authorities.

The Puerto Salgar-Bogota line was built by Williams Brothers for the Department of Cundinamarca.

The Department of Caldas has proposed a line from La Dorado to Manizales and Cartago. The Department of Valle is considering an extension of the proposed line from Cartago to Cali or, alternately, a line from the port of Buenaventura on the Pacific coast to Cali. Extension of the Cali line would pass through an area which is suitable for more intensive agricultural development and would consume domestic products refined at the Empresa Colombiana de Petroleos refinery at Barranca Bermeja now in process of enlargement.

The new line being constructed by Williams Brothers from Cantimplora to Puerto Salgar consists of 92 miles of eight inch pipe. A single pump station provides an initial capacity of 22,000 b/d. This is far larger than the capacity of the line from the Barranca Bermeja refinery to Cantimplora. Additional products required for the new section will be brought up the Magdalena river by barge, at least for the present.

No outstanding problems faced the builders of the line. The terrain is flat, although it does traverse a tropical river valley which requires line builders to clear a right-of-way through swampy terrain with a heavy growth of vegetation. The building season is limited to the dry period of the year.

Since the line parallels the river, Williams Brothers decided to operate from a moveable river base. An old 1926 stern wheel river boat was purchased, stripped of machinery, etc. and towed to Puerto Salgar where it was fitted out as an operating headquarters. The first deck was used as a warehouse for supplies, as a machine shop and to house a water plant and generators. Upper decks were used to house the staff and provide office space. The 35 x 130-foot boat had a 3-foot draft, making it suitable for close in-shore operations without docks.

A second smaller boat 30 x 90 feet was converted from a steel barge to a bunk house. Columns were welded to the deck and kitchen, dining room and bedroom facilities installed. Both boats were towed along the river as work progressed.

Williams Brothers had two small tugs which were supplemented by renting a third. One of the house-boats was badly damaged by fire during the construction and had to be rebuilt.

In addition to the river boat facilities, the equipment included three trailers for use as bunk houses, one service and one kitchen trailer. These were moved by line tractors. At the two tributary river crossings, all right-of-way equipment was loaded onto the Magdalena river boats.

The line was laid mostly above ground except for two river crossings, where the pipe was wrapped and coated. In swampy parts of the area traversed, the pipe was placed on skids. Insulating joints were installed at 10-mile intervals and potential measurements are to be made at intervals to determine whether cathodic protection will be necessary.

Four products are to be pumped through the line: aviation gasoline, motor fuel, kerosine, and diesel fuel. The single station is equipped with 6-stage 4 x 6 centrifugals driven by diesels through speed increasers.

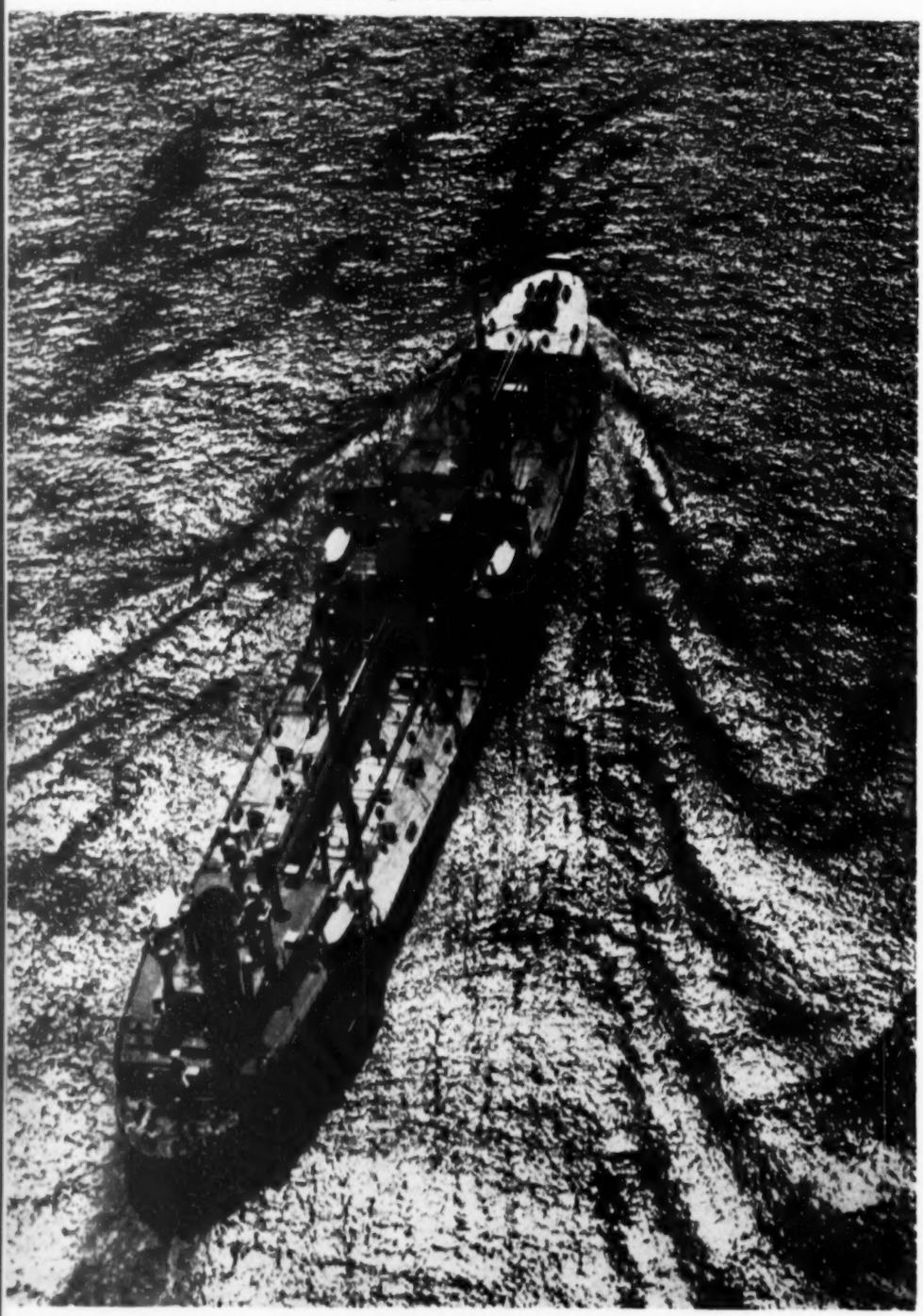
FM radio is employed for communications along the line, voice and teletype operated on a 40 to 50 megacycle band. AM radio is available as a stand-by for voice communication at three and five megacycles.

Further expansion of products pipe lines in Colombia is expected to be carried out at an accelerated rate to supply the rapid growth in demand for petroleum products. In 1952 the Barranca Bermeja refinery had an output of 10.3 million barrels of refined products of which only 2.4 million barrels was moved by pipe line. The nation consumes nearly nine million barrels of products per year, of which nearly a third is imported because of transportation difficulties. An adequate system of products lines will eliminate a great proportion of the current imports.

Converted steel barge which served Williams Bros. crew as bunkhouse.

Intermediate outlook for foreign trade

S/S J. L. Hanna, Standard of California tanker, heading out to sea.



By James Spear Taylor

A PROSPECTIVE sharp drop in exports, particularly of refined products, dominates the outlook for the United States' foreign trade in petroleum during the next two to three years.

Nevertheless, relatively little public attention has been given to export trends, except as regards the bearish outlook for lubricants and the probable continued strong demand for aviation gasoline.

This lack of attention arises partly from past experience, as revealed in the figures shown in Table I, page 68: (a) notwithstanding previous predictions of a large decline, oil exports during the post-war period have in fact fluctuated within a fairly narrow range; (b) in historical perspective, any conceivable loss in exports does not loom large in relation to import potentials; (c) if United States oil loses foreign markets by economic competition, no action by government is likely to regain them.

Exports of petroleum during 1952 from the continental United States, amounting to 436,000 b/d, were divided geographically as shown in Table II.

It is evident at first glance that some of the United States' leading foreign oil markets appear vulnerable to sizeable contraction, even within the next twelve months. However, an evaluation of the total export outlook requires systematic consideration of the several leading divisions of the market.

Starting with the last and largest item, it is evident that the Eastern Hemisphere's imports of refined products during 1952 resulted from deficiencies in operating refining capacity. In addition to the pronounced shortage in general refining capacity in the entire area east of Suez, which could hardly have been otherwise with the 550,000 b/d refinery at Abadan shut down throughout the year, the Eastern Hemisphere was definitely lacking in facilities for making its own aviation gasoline and lubricants, as well as wax, coke and certain other specialties. Further, the operating refining capacity was definitely out of balance with respect to yields of kerosine and distillate fuel, and required relatively heavy imports of these products both from the Caribbean and the United States.

Looking ahead, the European refinery

of the United States

expansion program is gaining on local consumption and Europe should be able to produce increasing surpluses of gasoline and residual fuel oil for export to other Eastern Hemisphere areas during the next two years. As the rate of refinery expansion in Europe tapers off, a whole batch of new capacity in Japan, the Philippines, Australia, India, Aden and South Africa will be coming into operation, mostly from 1954 to 1956. For any imports of kerosine and distillate fuel oil that might be required from the Western Hemisphere, it will presumably be more advantageous to the Eastern Hemisphere, from the point of view of foreign exchange, to buy from the Caribbean rather than from the United States.

This is particularly likely to be true of the United Kingdom, which in 1952 apparently was the best Eastern Hemisphere customer for United States refined products, because of the British and British-Dutch companies' relatively large interest in production and refining capacity in Venezuela, Trinidad and other Caribbean countries.

Other western hemisphere (OWH) markets of about 60,000 b/d for the four major bulk products (see Table III, page 69) from U. S. refineries would appear vulnerable in due course to substantial inroads from Caribbean refineries, especially since the latter are faced with loss of business in various Eastern Hemisphere areas. The lack of flexibility in Caribbean refineries, however, combined with restricted outlets for residual fuel oil, will cramp them in exploiting markets for lighter products.

It appears that during recent years, when the Caribbean refineries have run short of outlets for residual fuel oil, the markets which they would normally supply with lighter products have had to be served from the United States. Thus far in 1953, Caribbean exports of residual fuel oil to the Eastern Hemisphere evidently have fallen well below the average of about 125,000 b/d reached in 1952; further, the Caribbean refineries apparently have not undertaken in recent months to expand their sales of residual fuel oil in the United States market at bargain prices, and there must be limitations on the amount that will be sold at the most recent posted price of $1.85 fob Caribbean shipping points. Without a rapidly expanding market for residual oils (the OWH market is just not large enough to fill the bill) it would appear that the large refineries at Aruba and Curacao, which together can top more than 850,000 b/d of crude, would be under considerable pressure to reduce their yield of residual oil from the customary 65 percent or more to an amount closer to the 55 percent yields of the more modern refineries in Venezuela and Trinidad.

By the final quarter of 1953, Canada's Vancouver Inlet refineries should reduce their current imports of about 18,000 b/d of crude oil from California to a much smaller figure, owing to the opening of the Trans-Mountain pipe line. Some backhauling of residual fuel from California to British Columbia might take place, in tankers used to carry the Alberta crude oil south to California. Also, a drastic cut is expected in the current across-the-border flow of more than 35,000 b/d of United States crude, mostly from the mid-continent area, to the Ontario refineries following completion in December of the Lakehead extension to the Interprovincial pipe line.

Canada also will doubtless make steady inroads in cutting down its imports of United States refined products, once refineries now building in British Columbia and Ontario begin operating with Canadian crude furnished from the Trans-Mountain and Lakehead pipe lines. A 10,000 b/d addition to the Imperial Oil Company's refinery at Ioco, British Columbia, is scheduled to come on stream about the end of 1953.

The Canadian position in regard to importing oil from the United States is unlike that of Europe in several important respects. No great foreign exchange pressure is involved, and local situations along the 3,000 mile border make some imports logical.

In sum, the world-wide outlook is for a continuing decline in exports from the United States, but by no means to zero.

Of the present stream of exports, only the following appear reasonably secure, as of the end of 1955:

(1) Shipments to Alaska, Hawaii, Puerto Rico and other United States possessions, amounting to about 46,000 b/d in 1952, and possibly about the same in 1955; this assumes that normal growth in demand will be offset by production to be made available by construction of a 10,000 b/d refinery in Puerto Rico;

(2) Aviation gasoline, about 40,000 b/d, unless production is reopened at Abadan, which has an avgas capacity of about 17,000 b/d;

(3) Local shipments of bulk products over the border to Canada and to Mexico to points not served by domestic refineries in those countries, possibly about 30,000 b/d at a rough estimate;

(4) Exports of specialty crude oils, including lube stocks to Europe, perhaps some 30,000 b/d in all;

(5) Lubricants, liquefied petroleum gas, petroleum coke, wax, and other specialties, possibly 40,000 b/d in all;

(6) An indeterminate amount of the four major bulk products; such shipments appear bound to result from temporary imbalances in foreign refining capacities and emergency needs. The United States is outstanding in the flexibility of its oil industry and is called on whenever oil is needed quickly.

In view of all these considerations, it appears unlikely that exports of United States crude oil and refined products would fall much below a range of 175,000 to 225,000 b/d by the end of 1955. Since exports during the first six months of 1953 were at a rate of 431,000 b/d, the decrease would amount to about 200,000 to 250,000 b/d, or an average yearly rate of decrease of from 80,000 to 100,000 b/d during the next two and a half years.

The domestic refining industry is vitally interested in the outlook by products. Table IV shows exports, in thousands of barrels daily, of products for the years 1948 to 1952, and for the first six months of 1953. Table V shows total exports and dollar values for the year 1952.

In the latter table, it is of marked interest that lubricants and aviation gasoline together account for more than 45 percent of the total dollar value.

In the light of an analysis made by the Petroleum Administration for Defense in March of this year it appears that exports of aviation gasoline in 1955 may not show much change from the 44,000 b/d rate indicated as of January 1, 1953, if Abadan remains closed. If it reopens, they might show a decrease of some thousands of barrels daily.

Exports of motor gasoline may be due

TABLE I

UNITED STATES OIL EXPORT-IMPORT BALANCE
(Thousands of barrels daily)

Year	Exports	Imports	Balance
1938	531	149	+382
1946	420	377	+ 43
1947	451	437	+ 14
1948	368	514	—146
1949	327	645	—318
1950	305	850	—545
1951	422	844	—422
1952	436	957	—521
1953 (Jan.-June)	431	1,081	—650

(+) designates net export balance
(—) designates net import balance

Source: Bureau of Mines

for a severe and early "beating" and appear likely to be followed by a sharp cut in outward movements of distillate fuel oil and kerosine. There is apparently no technical or practical reason why the world's foreign refineries as a group would be unable to improve their facilities by the end of 1955 so as to meet their demand for these bulk, light products without having to obtain supplemental supplies from the United States.

Exports of residual fuel oil likewise appear destined for a marked drop, although it is not certain how long the movement to Japan, which reached 12,000 b/d in 1952, will continue. Presumably it represents back-hauling in the tankers that bring eastern hemisphere crude oil across the Pacific to the United States. Also, it is possible that the export of residual fuel oil to Canada, which more than tripled from 1946 to 1952, reaching 19,000 b/d in the latter year, might continue to show strength.

The third report on oil refinery expansion in the OEEC countries gives the following data on lubricant refining capacity per stream day for the OEEC area at the end of each year:

Year	Capacity Thousands b/d
1951	35.6
1952	37.7
1953	50.6
1954	57.3

From this, it appears that an increase in capacity of nearly 20,000 barrels per stream day is to come into operation during the two years 1953 and 1954.

In view of the high value of exports of lubricants, which reached a total of more than $270,000,000 in 1952, it is no wonder that the domestic industry has expressed concern over the sharp decline that has taken place thus far in 1953, and over the future outlook.

Among the so-called minor products, it is of interest that wax exports are especially well distributed, geographically. On the other hand, Canada and Mexico together took 84 percent of the LPG and Canada took 40 percent, and Japan 36 percent of the petroleum coke going to foreign countries.

Asia, Indonesia and the Philippines took 63 percent of the asphalt, the largest shares going to India and Indo-China. This regional market appears vulnerable to competition either from the possible reopening of Abadan, or the completion of new refineries in the area east of Suez.

Petroleum imports into the United States are dominated by crude oil and residual fuel oil, as shown in the following data for the year 1952:

Item	Imports Thousands b/d
Crude Oil	573
Residual Fuel Oil	351
Unfinished Oils	14
Asphalt	8
Distillate Fuel Oil	7
Motor Fuel	5
Total	958

Excise duties effectively shut off volume imports of the lighter products and of lubricants.

Anyone attempting to forecast the probable change in volume of crude oil imports between now and the end of 1955 would be bold indeed, even assuming that all proposals for restrictive legislation are rejected.

Nevertheless, one phase of the subject appears certain; the two major pipe line projects, which will bring Canadian crude oil to United States borders on Puget Sound and in the Great Lakes area, introduce a new element. Initially some 50,000 b/d of crude oil moving into California might displace an equal amount now being imported from Saudi Arabia, Venezuela and Mexico, and thus have no direct effect on the volume of total United States imports. Another 35,000 b/d may in due course displace the same amount now being brought in from Sumatra, as outlets for that oil are provided in new refineries in Australia and the Philippines. Most of the 34,000 b/d required to supply the General Petroleum refinery at Ferndale, Washington, when it goes on stream at the end of 1954, presumably will come from Canada. The same is likely to be the case with the Shell Oil Company's projected 50,000 b/d refinery at Anacortes, Washington, and with the Pacific Oil and Refining Company's 10,000 b/d project at Seattle.

The Interprovincial-Lakehead system also could supply, at least potentially, substantial quantities of Alberta oil for use in the Michigan-Chicago areas. Imported oil in that region, much of it produced by American companies operating in Canada, might prove very attractive indeed to local refiners faced with constantly expanding markets.

Examination of past data relating to crude oil imports and domestic production throws at least some light on what may be expected in the future. Between 1946 and 1952 production of domestic crude oil and natural gas liquids increased by an average of 300,000 b/d *per annum*. It seems logical to expect an annual increase in domestic production at least no greater.

Assuming an average annual increase of 450,000 b/d in domestic demand for the two and a half years from mid-1953 to the end of 1955, and an average annual decline in exports of 90,000 b/d, supply could be equated as follows, and be in line with historic trends as to domestic production:

Item	Average Annual Change, b/d
Increase in domestic production of crude oil & natural gas liquids	250,000
Decrease in exports	90,000
Increase in imports (crude & products)	110,000

Doubtless a yearly increase of 250,000 b/d in domestic production appears too low to those who believe that imports are now too high, and too high to those who are pessimistic about the rate at which new domestic reserves have been added during the past 18 months. To add 250,000 b/d annually to the rate of production requires, over the long run, discovery of about 1.1 billion barrels of oil and natural gas liquids above the current annual production, which may average about 2.7 billion barrels during 1953-1955. Average total discoveries for the three years 1950-1952 were 3.9 billion barrels per year.

An average annual increase of 110,000 b/d in total oil imports would be higher than the average increase of 97,000 b/d during the six years ending in 1952. Of this average increase, crude oil accounted for 57,000 b/d, or 58 percent. However, during 1953, it appears that imports of refined products will show only a minor increase, while crude oil imports are likely to increase above those in 1952 by more than 80,000 b/d. This estimate is based on actual crude oil imports for the first half year, and for the second half year, it is based on company estimates to the Texas Railroad Commission, together with an allowance for pipe line imports from Canada.

A wide range of intangibles enters into the actual level of crude oil imports. Thus, companies with crude oil sources abroad

TABLE II

EXPORTS OF PETROLEUM FROM THE CONTINENTAL UNITED STATES DURING 1952[1]

Destination	Crude Oil	Refined Products[2]	Total
	(barrels daily)		
Alaska, Hawaii, Puerto Rico, etc.	———	46,000	46,000
Canada	56,000	74,000	130,000
Other Western Hemisphere	11,000	76,000	87,000
Eastern Hemisphere	6,000	167,000	173,000
Total	73,000	363,000	436,000

Source: Bureau of the Census and Bureau of Mines.

(1) Military shipments not included.

(2) Geographical distribution estimated by the author for 35,000 b/d aviation gasoline over 90 octane rating, and for 17,000 b/d aviation and automotive engine and gear lubricants, for which country of destination was not released by the Bureau of the Census.

assert their desire to protect their investments in domestic production against demoralization of the market that could result from excessive imports. Again, the defense agencies urge maintenance of substantial shut-in reserve producing capacity as a strategic safeguard.

The East Coast market of the United States has traditionally been a market for residual fuel oil from many sources, a market capable of considerable flexibility in adjusting to changes in volume of supply. As shown by a National Petroleum Council study made in 1952, the price has more often than not been below "parity with coal" at seaboard points.

A glut in the market during the latter months of 1952 resulted in marked price weakness, together with political remonstrances from domestic oil and coal interests. The volume of imports fell in due course. The 25-cent rise in price of residual fuel oil (Bunker C) in cargo lots at Gulf and Caribbean shipping points to $1.85 a barrel and to $2.25 a barrel in barge lots at New York may, if it holds, tend to restrict any further spectacular spurts in volume of imports of this commodity. The average annual gain in imports of residual fuel oil from 1946 to 1952 was approximately 38,000 b/d. A forecast of a substantially lower yearly rate of increase appears to be well justified. Since no one can make an exact forecast of domestic demand two years hence, an element of uncertainty enters into all such calculations.

In conclusion, it must be kept in mind that the preceding discussion of trends extends only for the next two or three years, during which exports may be expected to drop to a nearly level "floor" of about 200,000 b/d. During this period, the United States net import balance might readily increase at a substantially greater rate than the 93,000 b/d yearly average increase during the past six years, during which the net export balance of 41,000 b/d in 1946 was converted to a net import balance of 520,000 b/d in 1952. (For purposes of comparison, net oil exports from the United States stood at 380,000 b/d in 1938, the highest on record, and fell to 41,000 b/d in 1946, an average yearly decline of 43,000 b/d.)

In another two or three years, assuming that the rate of exports becomes relatively stable, the periodic changes in net import balances will once again hinge on only two major factors, namely, imports and domestic production. By that time, the results of any growth in the rate of exploration and development of new reserves which may result from the recent crude oil price increases should be apparent. Any large accomplishment in discovery would tend to retard the rate of growth of imports.

On the other hand, disappointing results would doubtless touch off a series of far-reaching developments not only in the oil industry, but in all other important segments of the nation's fuel economy.

TABLE III

UNITED STATES PETROLEUM EXPORTS 1952, GEOGRAPHICAL DISTRIBUTION CRUDE OIL AND FINISHED MAJOR PRODUCT CLASSES
(Thousands of barrels daily)

Destination	Crude Oil	Motor Fuel	Kerosine	Distillate	Residual Oil	Lubricating Oil	Total Finished Major Products	Total Crude & Finished Products
Canada	56	12	2	27	19	2	62	118
Other N. America, inc. Caribbean Is.	7	15	—	22	14	1	53	60
South America	5	1	1	2	4	3	9	14
Total W. Hemisphere	67	28	4	50	37	6	124	192
Europe	4	7	4	22	5	11	49	53
Asia	2	3	6	8	15	5	37	39
Africa	—	2	5	4	1	2	15	15
Oceania	—	4	—	1	4	2	10	10
Total E. Hemisphere	6	17	15	36	24	20	112	118
Undesignated areas	—	35[a]	—	—	—	17[b]	52	52
Total Foreign	73	81	19	86	61	42	289	362
U.S. Territories & possessions	—	21	2	7	15	1	45	45
Grand Total	73	101	22	93	76	42[c]	335	408

Source: Bureau of Mines and Census.
[a] Aviation gasoline above 90 octane (preponderantly to Eastern Hemisphere).
[b] Aviation and automotive lubricants (preponderantly to Eastern Hemisphere).
[c] Does not include greases.
Note: Items may not add exactly to totals owing to rounding.

TABLE IV

U.S. PETROLEUM EXPORTS—1948 TO 1953

CRUDE OIL AND PRODUCTS BY CLASS
(Thousands of Barrels Daily)

Item	1948	1949	1950	1951	1952	1953 (Jan.-June)
Crude Oil	109	91	95	78	73	70
Motor Fuel	102	108	68	110	101	104
Kerosine	10	7	6	19	22	23
Distillate Fuel	58	34	35	62	93	102
Residual Fuel	36	35	44	79	76	70
Lubricants	35	35	39	48	44	33
Wax	3	3	3	4	3	3
Coke	8	7	7	12	11	10
Asphalt	4	4	3	3	6	6
Liquefied Gases	3	4	4	6	7	8
Total Products inc. Miscellaneous	259	236	210	344	363	361
Total Crude Oil & Products	368	327	305	422	436	431

Source: Bureau of Mines.

Note 1. Items may not add exactly to totals owing to rounding and omission of small quantities of products classed as miscellaneous.

TABLE V

U.S. PETROLEUM EXPORTS 1952
CRUDE OIL & PRODUCT CLASSES BY QUANTITY & VALUE

Item	QUANTITY (Millions of Barrels)	VALUE (Millions of Dollars)	Per Barrel	AVERAGE VALUE Per Unit Other than bbls.
Crude Petroleum	26.7	$78.4	$2.94	
Aviation Motor Fuel	13.0	97.8	7.52	17.9c per gal.
Motor Gasoline	12.9	62.1	4.81	11.4c " "
Nat. Gasoline, Blending Agents, Naphtha	3.6	18.8	5.23	12.4c " "
Kerosine	7.1	28.6	4.00	9.5c " "
Gas Oil & Distillate Fuel Oil	31.3	110.9	3.54	8.4c " "
Residual Fuel Oil	22.4	45.8	2.04	
Lubricating Oils & Greases (15 grades)	15.7	272.2	17.40	41.4c per gal.
Unfinished Oils	0.1	0.7	6.77	16.1c " "
Petrolatum & Petroleum Jelly	0.2	3.9	18.70	6.7c per pound
Wax (3 grades)	1.0	17.9	17.28	6.2c " "
Petroleum Coke	4.2	17.0	4.10	$20.46 per short ton
Petroleum Asphalt	2.1	13.3	6.24	$34.30 " " "
Liquefied Petroleum Gas	2.2	10.9	4.96	2.4c per pound
Total	142.5	778.3	5.39	

Source: Census.

Note 1: Quantities do not include shipments to offshore territories of the United States which are included in Bureau of Mines data, and in all other tables in this article.

Note 2: Values of exports usually reflect charges for containers, such as drums for asphalt; however, value of cylinders for L.P.G. is not included.

Vapor lock and icing problems solved by new carburetor

Major F. C. Melchior

WITHIN THE PAST month patent applications have been filed covering a radically new type of carburetor for internal combustion engines. The new carburetor has important implications for the petroleum industry because it operates as a closed system with direct injection of fuel into the intake manifold. Result is complete freedom from vapor lock with motor fuel of any feasible vapor pressure and insurance against icing. Its commercial adoption would do much to eliminate the growing butane surplus.

Maximum fuel economy is said to be achieved through accurate metering under all conditions of operation in response to air flow factors. Optimum air/fuel ratios are maintained without the usual distortions created by changes in density of air or fuel, acceleration or gravitation forces.

The new type of carburetor is based on the use of self-contained pressure responsive diaphragm capsules similar to those employed in the aneroid barometer. The particular capsules were developed by the inventor in an effort to create a supersensitive altimeter which might be employed to aid in blind airplane landing.

Inventor of the new carburetor is Major Frederick Christian Melchior, U. S. Air Force Reserve, who has spent most of his active life in aviation and aeronautical engineering. He became an airline pilot in Sweden in 1925 and a year later joined the Junkers Corporation of America as technical representative and test pilot. Late in World War II he began working on a landing altimeter which he hoped would have an overall accuracy well within five feet, as compared with ± 40 feet in the present aircraft altimeter. In order to achieve such accuracy and to make practical use of it when obtained, it not only became necessary to improve the performance of available pressure sensing elements, but also to create an entirely new method of indicating minute pressure variations, in place of the conventional "dial and pointer" system in which the friction of gear trains and bearings impedes the operation of the elements and in which the readability is unsatisfactory.

The solution was a radical departure from conventional practice. The capsules have been "unloaded," their motion being transmitted by way of a simple spring flexure holding in suspension a lever of a length designed to attain about a 6:1 mechanical magnification of the capsule deflection.

Reporting on a highly magnified scale was achieved by means of a "seeking" or "follow-up" mechanism cooperating electrically with the lever and mechanically synchronized with a continuous, custom calibrated tape scale about 600 inches long. A servo mechanism was later adopted to drive this scale past a hairline for direct visual readings.

Early prototype tests with this design principle indicated a perfectly balanced, frictionless system of such potential performance that immediate steps were taken to develop better pressure sensitive capsules.

To eliminate the troublesome effect of temperature on the elastic modulus of usual capsule materials, Major Melchior adopted "Ni-Span C," an age-hardening nickel base alloy with a near-zero thermoelastic coefficient. Material was difficult to fabricate, but methods were developed to make deep draws and to weld the opposing diaphragms. Final result was a highly sensitive capsule with minimum hysteresis.

At some point in the seven years of research which went into development of the altimeter, the device became a laboratory and process instrument for precise pressure measurement rather than an airplane landing device. For about a year, it has been commercially produced in the United States as a precise pressure cell under the trade name "Press-i-Cell" by Fischer and Porter Co. The commercial unit is guaranteed to have an overall accuracy of better than one part in 5,000; sensitivity one part in 15,000; repeatability one part in 7,000; and a readability of one part in 25,000. Changes in elevation of as little as three inches are reported by the servo mechanism, which would imply an actual sensitivity of better than one part in 100,000.

Work is going on at present in the development of an instrument for reporting liquid levels in tanks where great accuracy is desired.

Major Melchior backed into the carburetor application a year or so ago when a mechanic's error in putting the wrong head on his motor gave him detonation trouble. He decided to use the capsules as a metering device to inject an alcohol-water mixture into his intake manifold at a rate proportional to the manifold pressure. His thought was that the capsules would give him a positive shut-off when the mixture was not needed, and thus avoid the difficulties which had been encountered a few years ago when injection had been tried in Ohio. From the knock suppressor, the device broadened into a pressure injection carburetor.

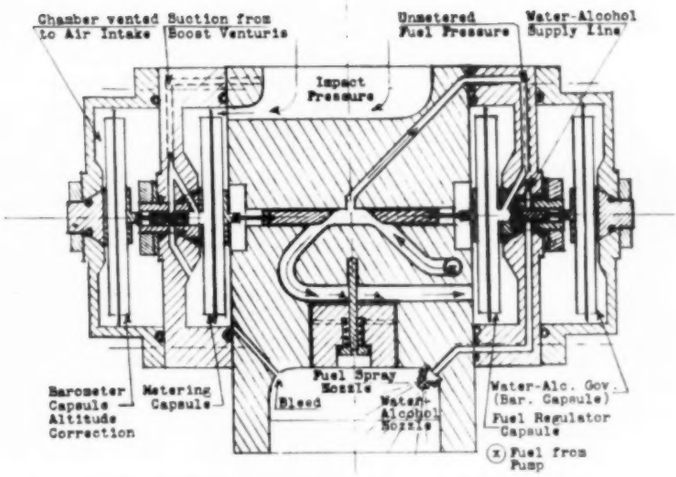


Figure 1. Longitudinal section of carburetor equipped with pressure sensitive capsules for water-alcohol injection and altitude correction in addition wo capsules required for accurately metering j to the spray nozzle.

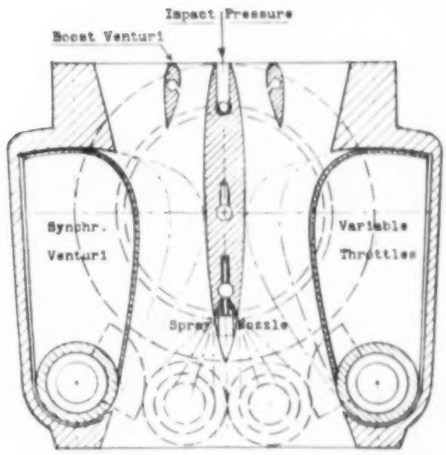


Figure 2. Vertical section illustrating how throttles maintain true venturi at all positions.

An understanding of the new Melchior carburetor can be had by examining the accompanying vertical and longitudinal sectional drawings. The vertical cross section shown in Fig. 2 shows the synchronized variable venturi throttles which are operated by a conventional throttle linkage to control the flow of air through the down-draft carburetor air throat to the manifold. Placed in the air intake are two boost venturi slots. Between these is placed a nozzle bar which receives the impact pressure of the mass flow of air as it enters from the intake scoop. The spring-loaded fuel spray nozzle is at the opposite end of the bar at the manifold opening.

The function of pressure sensitive capsules can best be seen in the longitudinal section, Fig. 1. Here it will be observed that the impact pressure of incoming air is communicated through a passage to the exterior of the metering capsule. Suction from the boost venturis is conducted through another passage to the interior of this capsule. The differential between the impact pressure and venturi pressure is a function of the mass flow of air for a given density and is proportional to the square of the velocity. This is the force which operates the metering needle controlling fuel admission to the spray nozzle.

A bleed passage from the metering capsule chamber leads to the manifold. This is designed to purge the chamber of any fuel condensate or leakage and to enrich the mixture at high manifold pressures.

In order to control fuel rate accurately over the entire range of operation, it is necessary to bring its admission pressure to the metering needle into correct relation to the mass flow of air. It should remain inversely proportional to the square root of the metering force applied by way of the capsule described above. To do this a second capsule is employed.

Metered fuel pressure is applied to the exterior of the second capsule shown at the opposite end of Fig. 1. This is the same as nozzle pressure.

The interior is exposed to unmetered fuel pressure. Effect of the arrangement is to cancel out the springloaded spray nozzle pressure and restrict the force operating on this capsule to the pressure drop across the fuel metering needle.

In operation, any reduction in air flow causes the metering needle to close partly. The higher pressure built up at this point causes the second regulator capsule to close a corresponding amount, reducing fuel pressure until an equilibrium is reached. Working in unison, the two needles form, in effect, a double variable jet controlling fuel in precise relation to air flow.

For aircraft carburetors, or on luxury cars where maximum performance and efficiency is required, the inventor proposes the addition of two more capsules. One is designed for alcohol-water injection to eliminate detonation under severe operating conditions and the other to control fuel mixture at high altitudes.

The capsule for alcohol-water injection is an evacuated and sealed aneroid unit actuated by absolute manifold pressure. Increased manifold pressure causes the capsule to open a passage leading to an auxiliary spray nozzle and inject variably controlled volumes of detonation suppressor.

The barometer capsule for altitude correction is installed in a chamber which is vented to the air intake scoop by two static tubes to obtain true static pressures. It responds to both temperature and pressure. As density of air decreases, the capsule operates a small plunger valve to bleed impact air into the suction passages and reduce the metering force. Correct air fuel mixtures are thus maintained under variable temperature and altitudes of operation.

The Melchior carburetor is not yet in commercial production. It is calculated that the 2-capsule automobile version can be sold at around $60, list price, which is about in line with popular automotive carburetors now in commercial use. The 4-capsule model for luxury cars would cost less than $100.

General use of the Melchior carburetor would permit inclusion of large excess volumes of butane in motor fuels, not now usable because of vapor pressure limitations of present-day fuel systems. In recent years the increase in catalytic cracking has greatly increased the volume of butane available at the average refinery. At the same time, the natural gasoline industry has been expanding its recovery of C_4 hydrocarbons from natural gas at a rate faster than LPGas and motor fuel blending market requirements.

Adoption of a pressure fuel system with manifold injection presents marketing problems, but refiners and natural gasoline manufacturers will watch the commercial development and testing of the new carburetor with great interest because of its potential effect on conservation of light ends and improved engine efficiency through more accurate carburetion.

Italy pushes exploration program

By Prof. Saverio Ilardi

IN VIEW of the prominence given recently to the exploratory activities of international companies in Italy, including surveys and test drilling by Gulf, Anglo-Iranian and others in the south and intensified operations in the Po Valley, it is worth while to refer to the program for systematic study of oil and gas possibilities in other parts of Italy. From recent announcements by Enrico Mattei, president of the Ente Nazionale Idrocarburi (National Hydrocarbon Authority), which is now coordinating efforts to discover and exploit hydrocarbons, it is possible to visualize the situation as regards exploration and discoveries in the Romagna and the drilling that has been going on in the south-central region of Italy.

In the years preceding World War II, a considerable amount of exploratory work was carried on by various companies operating in different parts of Italy. Some of the wells put down in the course of these investigations revealed the presence of oil and gas, though in the main the deposits located were too small in volume for successful commercial operation. From the time of its organization, the Azienda Generale Italiana de Petrolio (AGIP) has taken an active part in studying areas that could be considered geologically favorable. Altogether, its pre-war operations in south central Italy included geological and geophysical prospecting of several thousand square miles and the drilling of 127 wells with a total footage of 162,871 feet. These activities were important not solely for the production obtained, but more particularly for the information gained as a preparation for later exploration.

Post-war exploration by private companies in south-central Italy has covered a rather wide range. The Societa Dalmine has conducted surveys, not yet followed by drilling, in the provinces of Firenze, Pisa, Livorno and Lucca. The Montecatini Company has done analagous work in the provinces of Sienna, Livorno and Pisa. This company is now engaged in test drilling in the provinces of Catanzoro and Cosenza where it has put down two wells with a total footage of 13,120 feet; the second of these has penetrated gas-bearing strata between 1,640 and 1,968 feet.

The Societa Bombrini Parodi Delfino has been operating in Frosinone province, making geological and geophysical studies. The Societa Terni has drilled a stratigraphic well in Latina province. In the provinces of Teramo, Pescara, Matera and Taranto, the Societa Ricerche Petrolifere Meridionali has carried out a program of seismic exploration and will soon begin drilling.

The firm of Ing. Ugo Baldini has completed seismic prospecting in the provinces of Pescara and Chieti and is preparing to begin exploratory drilling. The same firm has made surveys also in Avillino.

The Societa Anonima Meridionale Metano is interested in wide zones comprised in the provinces of Aquila, Chieti, Caserta, Latina, Campobasso, Napoli, Avellino and Solano, where it will soon begin drilling.

The Societa Terra Apuliae (SNIA Viscosa) has made preliminary studies over a large zone of Foggia province. Other firms have been engaged in activities of minor importance or have recently obtained new concessions.

During the war period, the only company that continued prospecting was AGIP, which during those years introduced the reflection-seismic method of exploration. After the end of hostilities the company was reorganized and amplified its minerals division.

The discovery of gas and oil fields in the Po Valley and the need for their careful delimitation and exploitation has attracted to that zone the majority of the technicians and most of the available equipment. Notwithstanding this, the AGIP has resumed exploration activity in south-central Italy and is pressing this work with increasing intensity.

A systematic program is being carried on in Marche, a region which even in pre-war years attracted the attention of prospectors for oil. Beginning in 1946, the Azienda resumed a geological study of the region, executing general and localized detailed studies over an area of 694 square miles. The results of this preliminary work led to a program of reflection-seismic exploration, first on an extensive basis applied over the whole coastal zone, then followed by intensive examination of particular sectors, the work being carried on by 14 field crews. The results prompted the drilling of deep wells at Marrovalle and at Rapagnano. The Rapagnano well No. 1 has been in operation for several months, producing 423,700 to 529,600 cubic feet of gas a day. Work in this zone is continuing.

Contemporarily with exploration in the Marche the company has carried on similar work in Puglie. Here also the indications found have led to the drilling of an exploratory well at Gaudiano, which has now reached a depth of 6,560 feet.

Exploratory drilling will shortly be begun in Frasinone province, wherein mechanical operations have not heretofore been possible because of the complexity of the geophysical relief, which has made it particularly difficult to ascertain the geological structure of the terrain. In this zone the Azienda has undertaken a program of exploration including the following operations:

Reconnaisance and general geological studies in Calabria, Puglie, Lazio, Abruzzi and Marche;

Detailed geological surveys in Marche over an area of 772 square miles;

Gravimetric surveys in Lazio;

Reflection-seismic and geo-electrical surveys in Puglie and Marche;

Six wells to be drilled in Puglie and Marche with a total depth of 34,522 feet, and one well drilling.

Although not strictly within the realm of hydrocarbons, it is interesting to note the development of energy from the use of underground steam. The law of 1939 gave to the state railway administration the right to search for and develop the use of underground steam and gas suitable for use in the production of electrical power in the provinces of Grosseto, Livorno, Pisa, and Sienna, a total area of about 4,632 square miles.

The Railroad Administration set up a subsidiary (S.A. Laderello) which is now operating in the Laderello zone. The present results are evidenced by the daily production of 3,000 tons of steam per hour and (in 1950) 1,839 million kwh of electricity. The present area under exploitation, about 3.86 square miles, appears capable of early extension to 7.7 and ultimately to 50 square miles. The Societa Terni has made geophysical explorations and drilled five exploratory wells in Viterbo province from which interesting scientific information has been obtained, but no appreciable industrial results.

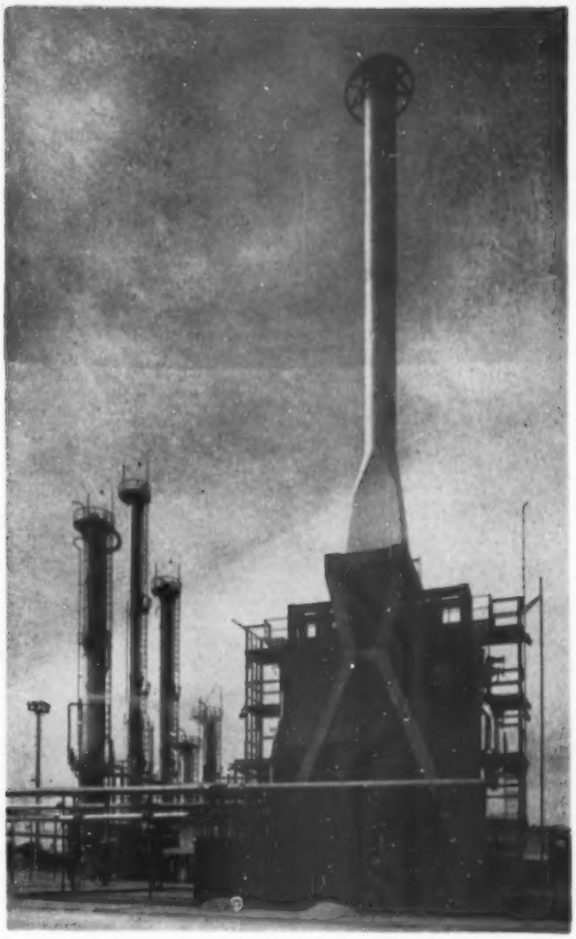
The S.A. Forze Endogene Napoletane has been active in Napoli province and has drilled numerous exploratory wells to a total depth of 14,942 feet, one of which furnished hot water and steam from deep wells. Other firms have done work of minor importance.

Concerning the mineral industry in general and particularly as regards hydrocarbons and natural steam, Sr. Mattei says that it is not easy to prophesy the results of the explorations in process.

In the present state of knowledge, the

only thing that can be affirmed is that the Adriatic and Ionian littorals present greater interest than the Tyrhennian littoral and that the favorable results obtained by the AGIP in Marche and by Montecatini in the Crotone plains, zones that are at about the extremes of south-central Italy, warrant the hypthesis of the existence of naphthogenic processes along the whole length of the peninsula.

On the basis of these prospects the AGIP has embarked on a vast program of studies and exploration which will be extended to the whole Italian peninsula. This could give a complete picture of the possibilities for finding hydrocarbons, and a basis for establishing a rational program of exploratory drilling.



Thermal reforming unit at the SAROM refinery, Ravenna, Italy.

New refinery serves northeastern Italy

By Alberto Girelli

A RECENT ADDITION to the oil processing facilities of Italy is the refinery of the independent company SAROM (Societa Anonima Raffinazione Olii Minerale) erected near Ravenna in the Eastern Po Valley area of North Italy.

The refinery started operation early this year, working on Middle East crude which is brought in by tanker from Sidon, Lebanon, by way of the Mediterranean and Adriatic, and through a four-mile navigable channel which leads to the refinery from the Adriatic. The channel is suitable only for relatively small ships and a pipe line is being built to permit deliveries from the coast by large tankers. Finished products are shipped from the refinery by railroad, tank-trucks, and by sea. The area where the majority of refined products is marketed is the agricultural district of Ravenna, Ferrara and Rovigo provinces. Products are distributed by the Esso Standard Italiana marketing organization.

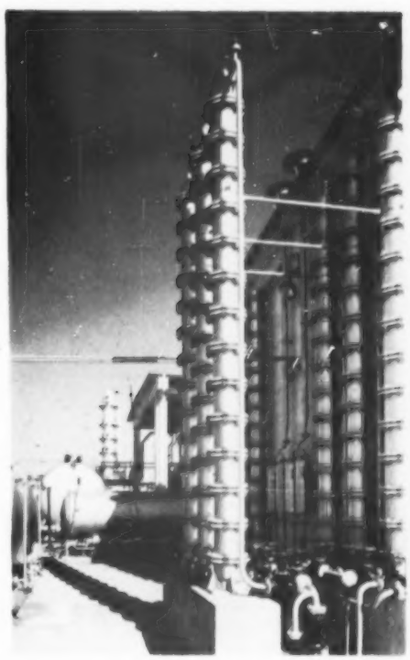
Throughput of the plant's topping equipment is 15,000 b/d. A thermal reforming unit can treat 1,600 b/d of a 130-210°C naphtha cut. Connected with the reformer are LPGas fractionation and recovery units with a bottling capacity of 2,000 LPGas cylinders per 8-hour shift. Other refining facilities include hypochlorite treating for gasoline and kerosine, acid-caustic washing for special kerosine cuts and jet fuel stocks.

Other facilities to be installed in the near future are visbreaking and catalytic cracking units.

At the present time the plant is geared to a production program of 26 percent motor gasoline (18 percent regular, eight percent premium grade), six percent kerosine (jet and regular fuel), 18 percent diesel and gas oil, 44 percent fuel oil, and two percent LPGas.

Design and technical direction in construction of the plant was provided by Tecnider S.p.A. of Milan. Breda Elettromeccanica of Milan installed topping and reforming units, Officine Maraldi of Cesena supplied tanks, chemical treating units and pipestills, and Worthington Italiana S.p.A. furnished the pumps. Control and measurement instruments were supplied by the German company Siemens. Other main facilities have been built by different Italian contractors.

Closeup of the chemical treating unit at the new SAROM refinery.



Resistance of modified Dextran to microbial deterioration

By Dr. Wm. L. Owen*

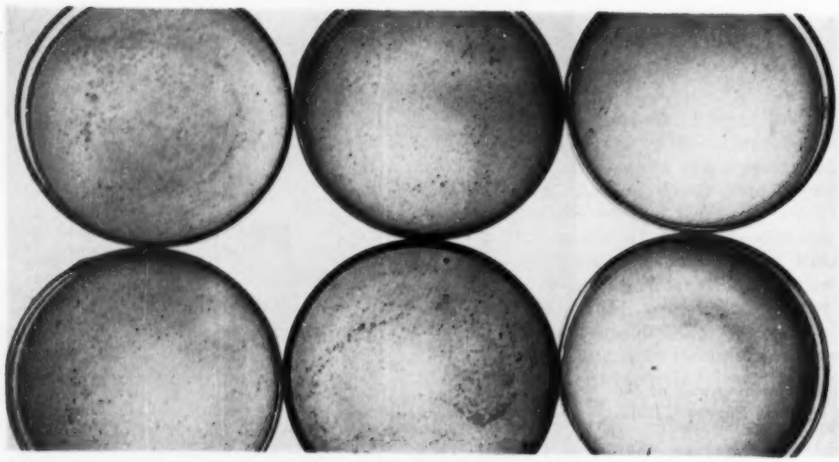


Figure 1: Comparative development of bacteria in starch and Viscoba suspensions in fresh water muds, 48 hours. Starch C left, starch I, center, and Viscoba right. Number of colonies times 10,000 equals count per cc in starches. Number of colonies times 100 equals count per cc in Viscoba.

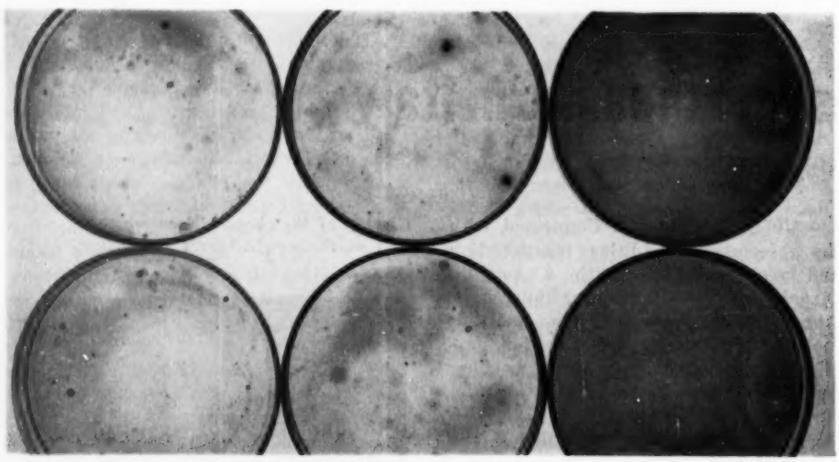


Figure 2: Ten days in saturated salt muds. Left to right: Starch C, starch I, Viscoba.

TABLE I

FERMENTABILITY OF STARCHES IN FRESH WATER

Series	Inhibitor	Date Inoculated	Date Gas Observed	Date Odor Detected	Date Completely Fermented
A	Starch C	1-13-53	1-16	1-17	1-20
B	Starch I	1-13	1-16	1-17	1-20
C	Starch M	1-13	Stopper Blown 1-16	1-17	1-20
D	Viscoba	1-13	Stopper Blown None	None	Feb. 27 (None)

TABLE II

FERMENTABILITY IN 1 PERCENT SALT SOLUTION

Series	Inhibitor	Date Inoculated	Date Gas Observed	Date Odor Detected	Date Completely Fermented
A	Starch C	1-20	1-26	1-23	Stopper Blown 1-26
B	Starch I	1-20	1-26	1-23	
C	Starch M	1-20	1-26	1-23	
D	Viscoba	1-20		None	Feb. 27 (None)

IDEAL QUALITIES and characteristics of a water loss inhibitor for drilling mud in the order of their importance are: (1) the product must be effective at fairly low levels of concentration; (2) it must be highly tolerant of high salt concentrations; (3) it must be resistant to degradative changes resulting from the action of microorganisms in the muds; and (4) it should not be prohibitively expensive. The cost of the ideal product would be a minor consideration, if its virtues were all that were designed and its inadequacies insignificant.

In a previous article[1] we have described the adaptability of modified dextran (Viscoba), as a mud additive. This article did not, however, stress the nonfermentable quality of the additive as a "water loss inhibitor." Any product that is effective as a preventive of water losses in muds, and is at the same time immune to microbial degradation, would be a panacea and a boon to the oil well drilling industry. The conditions under which the use of water loss inhibitors become necessary to control viscosity and prevent fluid loss are given by Rogers[2] in his most recent reference work.

While Rogers defines the maximum limits of salt concentration tolerance of bacteria as based upon oil well drilling experience to be at the level of 20 percent, there is little doubt that bacteria exist which can grow in much higher concentrations of sodium chloride. Whether these are ever encountered as a natural flora of oil well drilling strata is open to conjecture, but it would appear that they might easily be built up under normal operations in salt water strata, or where added saline is used over long periods of time.

A review of the literature on the resistance of the halophilic bacteria to high levels of salt concentrations reveals that not only can they live in salt concentrations that would usually be regarded as of preservative strength, but that these require such salt concentrations for their normal propagation. For example, Zobell, Andersen and Smith[3] (1937) isolated from the waters of Great Salt Lake, which has an average salt concentration of 27.5 percent sodium chloride, a species of bacteria which quickly died off when this water was diluted to a level of 1.3 percent. These obligate halophilic bacteria may develop and attain rather high concentrations in salt water basins and may be built up in fairly pure cultures by continually transferring fermenting brine drilling muds to fresh muds from these wells.

There is considerable evidence that salt itself may contain an indigenous bacterial

* The Wm. L. Owen Laboratories, Baton Rouge, La.

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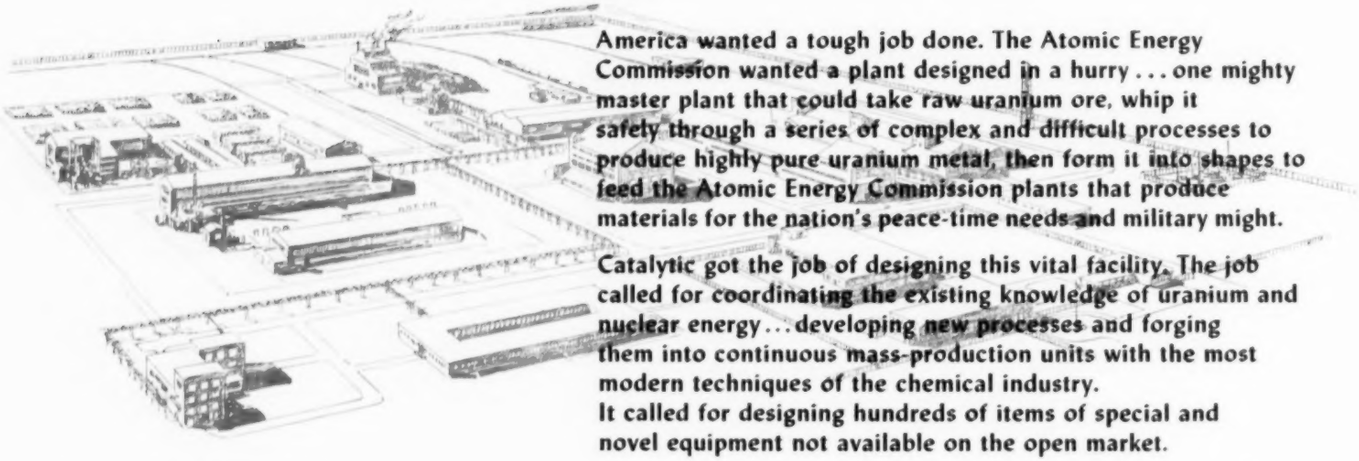

Artist's conception of Feed Materials Production Center at Fernald, Ohio, whose initial operations were announced by the Atomic Energy Commission on May 15, 1953

America wanted a tough job done. The Atomic Energy Commission wanted a plant designed in a hurry . . . one mighty master plant that could take raw uranium ore, whip it safely through a series of complex and difficult processes to produce highly pure uranium metal, then form it into shapes to feed the Atomic Energy Commission plants that produce materials for the nation's peace-time needs and military might.

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TABLE III

FERMENTABILITY IN SATURATED SALT MUD

Series	Inhibitor	Date Inoculated	Date Gas Observed	Date Odor Detected	Date Completely Fermented
A	Starch C	1-20	1-26	1-23	2-15
B	Starch I	1-20	1-26	1-23	2-15
C	Starch M	1-20	1-26	1-23	2-15
D	Viscoba	1-20	None	None	2-27 (None)

TABLE IV

MICROBIAL DEVELOPMENT IN SATURATED MUDS

Sample	Type of Inhibitor	No. Bacteria per cc
A	Starch C	30
B	Starch I	22
C	Viscoba	2

flora, and Rappin[4] isolated, from both crude and refined salt, bacteria which were responsible for the spoilage of butter and cheese. Natural brines with a salt concentration of over 25 percent sodium chloride have been found to contain bacterial concentrations of upwards of one hundred bacteria per cc. Incidentally, as one of the species of halophilic bacteria, *Bacteroides halosmophilus*, isolated by Baumgartner[5] forms gas from sugars and starches, and might well prove to be one of the active species in the deterioration of muds in the presence of subsaturation concentration of sodium chlorides.

In connection with our study of water loss inhibitory, "potentials of starches and water soluble gums," in comparison with our modified dextran (Viscoba), we studied the bacterial concentrations in a sample of deteriorated mud submitted to us by one of the larger oil companies. This material was plated out on a variety of substrates and the count of aerobic or faculative aerobic bacteria was found to be approximately 550 per gram. The count would not have included the obligate anaerobes, of which there were quite a large number present, as indicated by the colonies that developed under strict anaerobic conditions of cultivation using a Novy jar and pyrogallic acid and a vacuum pump for the initial exhaustion of the oxygen present. Some of the initial tests made of the fermentability of starches in fresh water suspensions inoculated with three grams per 100 cc of the fermenting mud are shown in Table I.

The comparative development of bacteria on the starch suspensions and the Viscoba may be seen in Fig. 1. The dilution of the Viscoba suspension used for plating was 1:100 while the actual starch suspensions were 1:10,000. The actual counts were as follows:

INHIBITOR	COLONIES PER PLATE	PER CC
Viscoba	2	260
Starch C	200	2,200,000
Starch I	150	1,500,000

It will be seen from Table I that the suspensions of special starch had completely fermented in one week at a temperature of 34°C, while the Viscoba suspension showed no evidence of deterioration after one week of exposure at the same temperature and after inoculation (as the others) with three grams of fermenting mud.

It was then that we repeated this experiment with a low concentration of sodium chloride (1 percent), with the inhibitors added in the same concentration as before, but the suspensions were inoculated from bacterial colonies developing upon Starch Agar when the latter was inoculated with the dilutions of the fermenting mud sample.

It will be seen from Table II that all of the starches fermented, as evidenced by the evolution of gas and the development of odors, but only the one suspension was completely fermented. Incidentally, this was the sample that had proven most effective as a "water loss inhibitor" in salt water muds. The Viscoba samples showed no evidences of fermentation as a result of the one week's incubation at a temperature of 34°C.

In the next experiment we used a saturated salt water mud from the oil fields and used as an inoculum one cc of a fermenting starch suspension from the previous tests. The fermentation in this material had been induced by bacterial colonies which had developed from the original fermenting mud, so it can validly be claimed that the species of bacteria present in the inoculating material employed in these tests were identical with those occurring in the original sample.

From Table III it will be seen that all of the starch suspensions showed fermentation characteristics such as gas and odor, and in slightly less than one month's time, all of the inhibitors with the exception of Viscoba had been completely fermented.

In order to trace the rate of microbial development in suspensions of these starches in saturated brine muds, a three percent suspension of two of these starches and also one of Viscoba was prepared in a field mud of this type. The samples for exposure were filled in 200 cc narrow mouth bottles, each bottle containing 100 cc of the mud with the three percent inhibitor thoroughly mixed into it. The bottles were then inoculated with one gram of the fermenting mud sample, and tightly stoppered and placed in an incubator for observation.

After 48 hours, one cc portions of the sample were plated out on Starch Agar and the results obtained were as shown in Table IV.

These samples were then incubated for 10 days at a temperature of 34°C and the counts were then found to be as shown in Table V.

The deteriorative effect of fermentative changes upon the effectiveness of starches and natural gums as water loss inhibitors in drilling muds is well known in the industry, and the cost of added preservatives to maintain the effectiveness of these materials and to preserve them from the destructive action of microorganisms constitutes a large part of the cost of materials used in drilling operations. The effective dosages of most of these preservatives vary from 10-20 percent of the weight of the starch or gum used, but in the case of sodium chloride, a saturated solution is maintained in the mud.

In order to determine the effect of bacterial action upon the water loss inhibition value of the above samples, they were tested before and after incubation with the results shown in Table VI.

It will be seen from this data that a bacterial development of from 30 to 700 per cc in the drilling mud containing Starch C was responsible for a water loss increase of from two to 44 cc in 30 minutes at 6 lb/bbl concentration. The incubated muds without inoculation gave the water loss values shown in Table VII during the above period.

It might be well to call attention to

TABLE V

MICROBIAL DEVELOPMENT AFTER 10 DAYS

Sample	Type of Inhibitor	No. Bacteria per cc
A	Starch C	700
B	Starch I	400
C	Viscoba	10

TABLE VI

EFFECT OF BACTERIA ON WATER LOSS

Sample	Type of Inhibitor	Lbs. Per Barrel	Wate. Loss 30 Min. Before Exposure	Saturated Salt Clay After Exposure For 10 Days at 34° C.
A	Starch C	6	2	44
B	Starch I	6	3.8	6.4
C	Viscoba	6	2.4	2.8

the fact that the total numbers of bacteria per cc as revealed by our analysis would ordinarily seem incommensurate with the degree of deterioration that the starch had undergone during the incubation period. However, it should be remembered that the numbers found by the plate assay could only include the aerobic species, while the anaerobic species would be entirely excluded. Then too, the comparatively low count, as measured by the degree of decomposition of the starch, might possibly be explained by the action of enzymes secreted by those species of bacteria that are most amylogenic, and which secrete diastase and convert the starch into the non-colloid form of dextrose which would have no virtue whatever as a water loss inhibitor.

The latter explanation would seem to fit the case and to serve to explain how the non-inoculated muds had about as high a total count as the inoculated ones containing starches, without seriously impairing the effectiveness of that substance as a water loss inhibitor in drilling muds.

There would be, we imagine, a great specificity as regards the adaptivity of the species of bacteria that might be indigenous to clays to grow in saturated brine muds, and this might explain the marked deteriorative potential of the species used to inoculate the muds in our experiments. The inoculum used was taken from a field fermenting mud and hence the species of bacteria were well adapted and conditioned to induce fermentation of starch under conditions where the non-holophilic bacteria would hardly survive.

The above results are significant since they show that even in saturated salt muds the deterioration of the water loss inhibitory powers of the best starches within a ten-day period may be very costly and critically severe. On the other hand, Viscoba retains its properties as an effective inhibitor of water loss over a long period of time even without the protection of the salt preservative.

Another interesting point revealed in our tests is that the presence of the more active and virile bacteria may be an essential criterion of the stability of a water loss inhibiting agent in a salt saturated mud. It will be noted that whereas the deterioration in the inhibitory powers of both starches was very significant where the muds had been inoculated with the type of bacteria that had been isolated from a fermenting mud from the field, there was little or no deterioration in the same type of mud that had not acquired a typical fermentative bacterial flora. Of course, under actual conditions in the field, the mud undoubtedly acquires from the various strata penetrated a microflora capable of inducing the same type of degeneration of starches as was exhibited in our tests of inoculation of muds.

In many cases the cost of salt or caustic required to maintain the effectiveness of the starches as water loss inhibitors is almost as much and sometimes more than the initial cost of the inhibitor. Rogers gives an example of a well drilling operation where the daily additions included 645 pounds of starch and 2,120 pounds of salt. In another case, where caustic was relied upon to maintain the effectiveness of the starch, daily additions totaled 360 pounds each of starch and caustic. In 1952 the oil well drilling industry spent over $2 million for resistant materials, at least five times as much as for the starches. The amount used might have been doubled except for the fact that these materials, of the carboxy methylcellulose type, have the disadvantage of raising the viscosity of drilling muds beyond the level where efficient operations can be maintained even when added in very low concentrations.

While it is too early to predict with any degree of accuracy the final level of market prices on Viscoba when commercial production is attained, it probably will be somewhat greater than for the best grade of starches. However, when the net cost of inhibitors is taken into consideration and allowance is made for the instability of the starches as a result of fermentation and degradative changes resulting from the action of microorganisms, we believe that modified dextran will be economical.

Field tests have not as yet been made, but tests conducted at the research laboraties of the larger oil companies are favorable.

First actual oil field tests will be made as soon as pending arrangements for pilot plant production are completed. Several oil producers have asked for sufficient tonnage of Viscoba to complete a number of drilling operations under varied conditions.

TABLE VII

WATER LOSS WITHOUT INOCULATION

Sample	Type of Inhibitor	Lbs. Per Barrel	Water Loss After Exposure In Saturated Salt Water Clay
A	Starch C	6	2.6
B	Starch I	6	3.8
C	Viscoba	6	2.4

TABLE VIII

TESTS SALT SATURATED MIXTURES—DEXTRAN Vs STARCH

Test Dates	Product	pH	Viscosity (cps.)	Gel Strength (gms) Init.	10 Min.	Water Loss (cc) Wall Test Ml.	Cake	Water Loss (cc) Very Good Grade Starch
3½ lb/bbl. Concentration	Viscoba	7.29	26.5	7	7	27.2	2/32	38.0
March 1953	Starch	7.54	26.5	2	7	31.8		
7 lb/bbl. Concentration	Viscoba	7.29	32.00	6	7	8.8	2/32	10.3
March 1953	Starch	7.53	37.00	3	11	9.3		
TESTS NEUTRAL pH								
3½ lb/bbl. Concentration	Viscoba	7.90	17.0	5	10	21.8		26.0
March 1953	Starch	7.85	11.0	2	10	17.8		
7 lb/bbl. Concentration	Viscoba	8.20	40.0	17	18	10.7		23.4
March 1953	Starch	8.03	17.5	1	11	11.0		
TESTS HIGH pH								
3½ lb/bbl. Concentration	Viscoba	11.00	13.0	1	9	20.3		23.6
March 1953	Starch	11.18	10.0	0	2	26.8		
7 lb/bbl. Concentration	Viscoba	10.80	32.0	7	16	10.5		13.3
March 1953	Starch	11.02	24.0	0	10	11.6		

CONCLUSIONS

1) One of the prime requisites of an ideal water loss inhibitor (other than its initial effectiveness for this purpose) is its resistance to deterioration from the effect of microbial activity in the muds to which it is added.

(2) All of the starches used for drilling are highly susceptible to rapid deterioration from this cause in fresh water muds, and also in fairly high concentrations of salt in salt water muds.

(3) While it is generally believed that starches are preserved from microbial deterioration in salt concentrations in mud over 38 percent, we have found that even in saturated brine muds these inhibitors are susceptible to fairly rapid deterioration when the contaminating bacteria are of that group of species which are predominant in fermenting field muds.

(4) In similar and comparative tests we have found that Viscoba (modified dextran) is entirely stable over the same periods of incubation, and that the effectiveness of the material as a water loss inhibitor is likewise not impaired by the presence of the species of bacteria indigenous to fermenting field muds.

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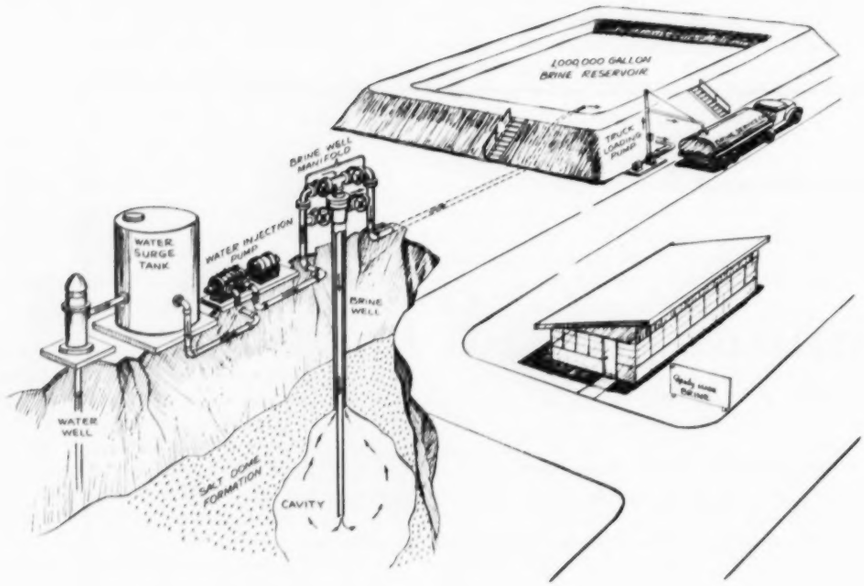

Layout of facility for the production and tank truck loading of fully saturated brine.

Salt water finds use in oil industry

SALT WATER, a nemesis in the search for new oil and gas reserves, finally is finding a useful place in the petroleum industry.

It wasn't too many years ago that the wildcatter met with failure when his drill dug into formations carrying either gas or salt water. Advanced scientific research has made a gas producing well almost as profitable as an oil well. Although such is not yet the case with a salt water well, engineering progress has made a place for it through the increased usage of brine in the oil and petrochemical industries.

The most popular use of brine in the oil industry is its application as a drilling fluid. Drillers have long recognized its usefulness in increasing mud weight, but the brine was either produced from formation or through dissolving rock salt on the location.

Today, on the Gulf Coast, the production of fully saturated brine has become an industry specializing in service for oil well drillers. About a quarter of a mile south of Houston city limits, brine is being produced from the old Pierce Junction salt dome. This brine is piped to petrochemical and other industrial plants on the Houston Ship Channel and is transported by tank trucks for use at refineries and at drilling sites in the coastal region.

One brine service company produces saturated brine from the Pierce Junction salt dome in almost the same manner as sulfur is produced from coastal domes. Two wells were drilled, one tapping solid rock at 3,700 feet and the other finding fresh water sands at 460 and 1,090 feet.

The fresh water is piped to a water surge tank and then is pumped into the brine well. The fresh water, not heated as is done in the sulfur producing process, dissolves the solid salt and is returned to the surface to enter a million-barrel brine reservoir. The brine thus produced is more than 99 percent pure and weighs 10.027 pounds per gallon. A gallon of saturated brine produced from the salt dome contains 2.64 pounds of salt (dry basis).

Oilmen say the use of brine has proved very successful in workover operations where heavy mud is required to control high gas pressures. In many instances brine is used by itself as a drilling fluid in these workover operations. Also, its use with other special drilling mud materials is becoming popular.

Engineers say brine is desirable in workover operation because it will not hydrate shales and clays in producing formations. By nature, salt water is native to oil formations.

Brine also has proved its worth as a drilling fluid in drilling through salt overhangs on the flanks of the coastal domes. Using all brine as a drilling fluid, the salt cuttings are returned to the surface readily because the fully saturated brine will not dissolve the salt formation. Fresh water used in drilling mud, oilmen say, will dissolve the salt formation, causing a cavity and thus returns are lost and operations halted.

Service is a necessity in oil industry operations and ready-made brine is just another contribution toward progress.

In the petrochemical and refining industries, saturated brine is used in the process of softening water piped to boilers, cooling towers, and water jackets.

Actually, brine regenerates a water softening compound containing sodium, aluminum and silicate. The sodium is lost as it battles the calcium in the hard water and fully saturated brine returns the sodium to the compound. About one-half pound of salt per 1,000 grains of hardness is used in the regenerating process.

Laundries and home water softening units also are big consumers of saturated brine.

As to the oil industry, the delivery service saves time and money for the domestic users of brine. Continued research may yet uncover other uses that will add to the value of salt water wells.

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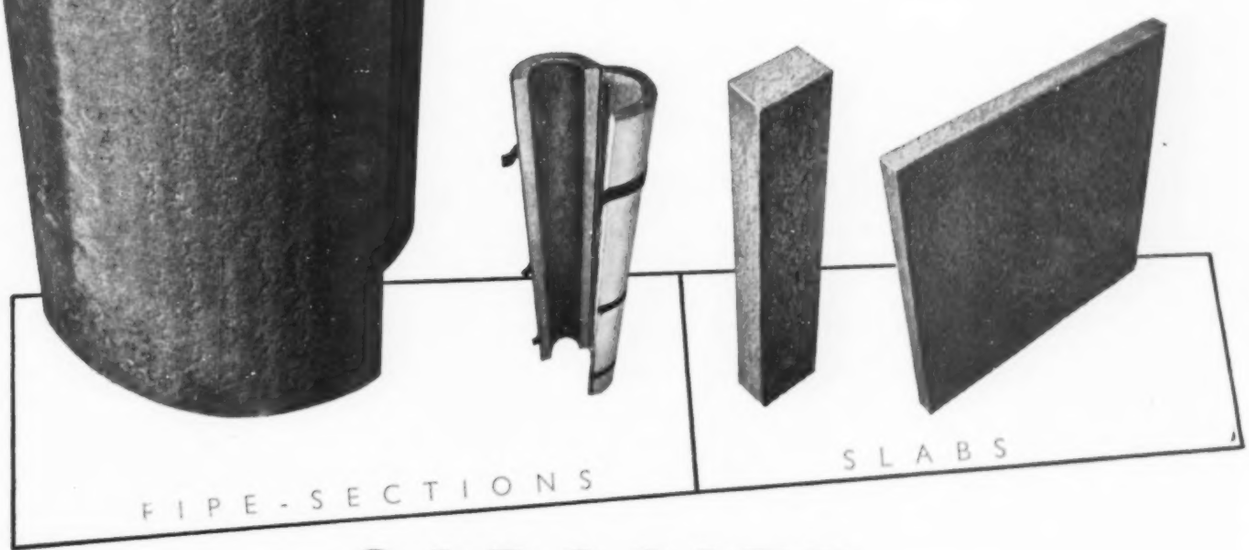

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By Ruth Sheldon Knowles

PERCHED on a wooded hill overlooking the sparkling Hudson river outside New York City is a spacious, rambling, country house whose idyllic aspect belies its function as a revolutionary headquarters. Nor is there the look of the revolutionary about its steady stream of visitors, who are quiet, conservative oil men, clergymen, writers, industrialists, housewives and teachers. Yet all of them are dedicated to sparking a new American revolution, one of ideas.

This revolution is, in the literal sense of the word, a turning back to the beginning, to the same ideas upon which the first American revolution was based, to free market ideas, voluntary society ideas, limited government ideas. These men and women are coming by the thousands, either in person or by the proxy of a mail carrier, to the Foundation for Economic Education at Irvington-on-Hudson, New York, in search of help and inspiration in tackling the most important problem of our time, the finding of a solution to the growing disrespect of private property, a disrespect which is also nourished under the names of Communism, Socialism, Planned Economy and Welfare State.

Everywhere in America there are signs of increasing awareness of the true nature of the affliction from which America and the rest of the world is suffering. Leonard Read, president of the Foundation for Economic Education, describes it as "social cancer, which like physical cancer seems also to have the capacity for inordinate growth. The cell of this affliction is not difficult to identify. The characteristic common to each of the so-called progressive ideologies is the belief in the use of force (power) as a means of directing the creative activities of individuals within society."

During the past twenty years the American philosophy of freedom has succumbed to this malignant disease to the extent that there is scarcely a healthy cell left in the body politic. Government control of creative behavior is accepted in farming, manufacturing, charity, security, education, insurance, labor and practically every kind of activity.

This increasing belief in government as the master rather than the servant of the people has been opposed by oil men more vigorously perhaps than by any other group. Seasoned by their own battles against government control of their industry, more and more oil men are realizing that without a true climate of freedom for every creative endeavor, victories limited to the oil industry alone have little meaning. Further, there is a growing realization that the remedy does not lie simply in opposition to legislative proposals but that the required solution is an educational one.

It is as necessary for those who have faith in a free society to become specialists in freedom as it is for geologists, engineers or business managers to be specialists in their fields. Failing that, it will not be necessary to specialize in any field—as the history of our time is all too grimly proving.

There is an unlimited supply of curbstone economists and cracker barrel political philosophers, but the more pertinent a discussion grows, the more inarticulate the believers in freedom usually become. This is the reason why the self-recruited students of liberty in the oil industry, those who believe that freedom is the priceless ingredient of each barrel of oil—are finding the Foundation for Economic Education a unique source of inspiration and guidance. One cannot sell liberty to someone else without first learning the art of its explanation and the Foundation's program is designed to make this art of explanation possible for everyone.

The Foundation is a wholly independent institution not dictated to by any "group." It is financed on a voluntary basis by those interested in finding the freedom answers, ranging from corporation contributions of $10,000 a year down to a typical $2 from a clergyman, who wrote "I have no money to squander, but I consider this an investment in security and true liberty. I must fight for the little I have as well as the much which my neighbor may have and to which he is entitled."

The Foundation's educational platform is simple but profound:

(a) No one will learn the philosophy of freedom unless he has the desire to do so.

(b) The desire is not yet general, simply because no one is presenting the philosophy adequately in depth or with clarity.

(c) This deeper understanding is a personal process of self-improvement as relating to these ideas.

d) The problem is not solved by doing something *to* some one else.

e) The self-improvement process, so far as FEE's staff is concerned, begins with themselves.

(f) What they learn they make available to all who can be interested in wanting such information.

(g) Finally, the proper method is not one of indoctrination but rather one of getting as many persons as possible, from all walks of life, to join in the search for a better understanding of freedom ideas.

Most of the Foundation's work takes the form of printed material: a single page, "Clippings of Note," 16-20 page "In Brief" pamphlets, 24-80 page booklets, and 96-200 page books. Single copies of all their publications and a place on the mailing list are free for the asking.

More than half of the publications are authored by others than Foundation staff

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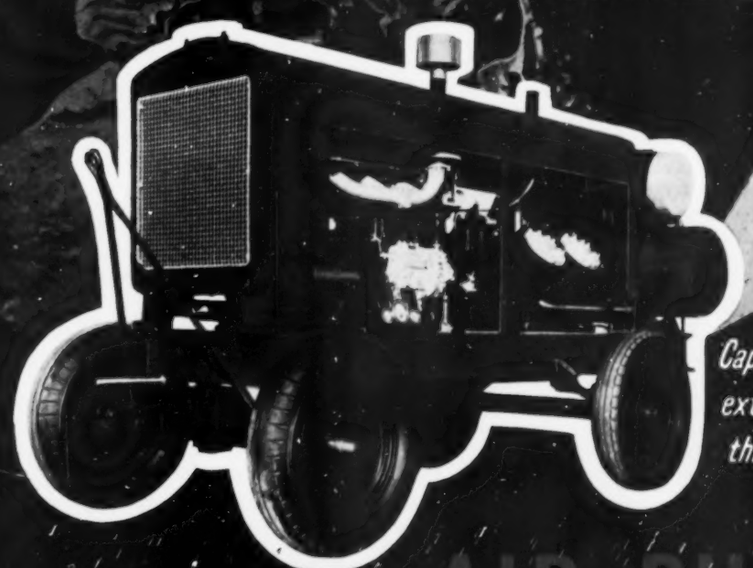

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members. For example, the address "To Communism Via Majority Vote," which Admiral Ben Moreel, board chairman of Jones & Laughlin Steel Corporation, delivered before the last annual meeting of the American Petroleum Institute, was issued as a booklet by the Foundation.

Whenever and wherever someone has made or makes a real contribution to better understanding and explanation of the freedom philosophy, it is published by the Foundation, whether it may be a radio address on "Where Karl Marx Went Wrong," given by Samuel B. Pettengill, former member of Congress from Indiana, or an impassioned and classic speech on "The Law" delivered by Frederic Bastiat before the French Chamber of Deputies a hundred years ago in an effort to prevent France from embracing socialism.

The Foundation's ten senior staff members, a group of brilliant thinkers, are such careful researchers in this complex field that almost 2,000 hours of work are done by them for every hour of reading material released. They have authored penetrating and lucid analyses of such important subjects as tariffs, pensions, TVA, inflation, human rights and the United Nations, stand-by controls, morals and the welfare state, charity (Biblical and political), ownership in common, property rights and human rights, ways to stop strikes, price supports, and the outlook of freedom. Their material makes so-called "heavy" reading a joy because of the understandable and interesting way in which it is presented.

Although the mailing list numbers over 30,000, including libertarians in many other countries, the number of people reached by these ideas is far greater. Writers incorporate the material in their own writings, teachers use it in their class work, clergymen in their sermons; businessmen use it as source material for speeches and order reprints for distribution to associates and employees. A recent Foundation release, "The Price of Price Controls," was reprinted in *Reader's Digest* in its domestic and foreign editions with a circulation of some 15 million. Magazines such as the *Saturday Evening Post* use Foundation material in their editorials.

What the Foundation accomplishes is aptly summed up in a letter from a newcomer to the mailing list: "You put tools in the hands of people who instinctively feel they are right, but who are so often driven into corners by the so-called 'social planners.'" Perhaps nowhere is there more fogginess of thinking and fallacious reasoning than in the fields of freedom and economics. For the individual who is aware that something is wrong in this world and feels uncomfortably that something should be done about it, the discovery of the Foundation as a source of clarification of ideas and an inspiration as to what can be done is like finding an oasis in the desert.

The Foundation has prepared an outline of a course of reading in its publications for those who want to become students of liberty, so that the initiate can begin with the easier pieces and proceed to the more difficult ones. In addition, they have prepared a bibliography on the voluntary society, one hundred selected titles in economics, history and philosophy, considered most worthy of study by anyone wishing to understand what a society of free men could be like.

The Foundation sponsors a fellowship program under which college professors spend six weeks during the summer working and studying with business firms. In 1952 a total of 106 professors from 83 American colleges and universities were awarded fellowships by 64 business firms in every part of the country. The professors have the opportunity to test theories and beliefs with actual business experience and the businessmen find unexpected benefits, both tangible and intangible, in the exchange of ideas. Almost every type of business is represented, and oil companies already participating in this program are Atlantic Refining Co., Gulf Oil Corporation and Standard Oil Company of Ohio.

The Foundation prepares special packets of books, pamphlets and bibliographical material for high school and college debate programs, where young thinkers are propounding such questions as "What Form of International Organization Should the United States Support?" and "Resolved That The Congress of the United States Should Enact a Compulsory Fair Employment Practices Law."

One of the Foundation's most unusual requests last October was from the State Prison Colony, Norfolk, Massachusetts, asking for material to enable the prison debating team to take the affirmative side of the proposition: "This House regrets the advance of the Welfare State," in a debate with the Cambridge University English team. The judges, a member of the Massachusetts Supreme Judicial Court, the Dean of Boston University School of Law, and a V.P. of Tufts College, voted two to one in favor of the logic of the debaters from the State Prison Colony against the Welfare State.

The Foundation was organized in 1946, under the guidance of its president, Leonard Read, former manager of the Los Angeles Chamber of Commerce and former executive vice-president of the National Industrial Conference Board. An ardent libertarian, author of many books and articles and in great demand as a speaker, Read has assembled an unusual staff of economists and writers who share his faith in free men. Among them are such personalities as Dr. W. M. Curtiss, former Cornell University professor of marketing; Dr. Paul L. Poirot, economist for the OPA during the war and later for the Cooperative Grange League Federation Exchange; Dean Russell, writer, small businessman and graduate student of Harvard and Columbia Universities; Dr. Russell J. Clinchy, former Congregational minister; Dr. F. A. Harper, noted writer and former Cornell University professor; and Thomas Shelley, former economics teacher.

The Foundation's Board of Trustees is an exceptionally notable one, including: Levin H. Campbell, Jr., chairman of the board, Automotive Safety Foundation; George Champion, senior vice-president, The Chase National Bank; J. Reuben Clark, Jr., director, Utah State National Bank; T. Jefferson Coolidge, chairman of the board, United Fruit Company; Jasper E. Crane, Wilmington, Delaware; Fred R. Fairchild, Knox Professor Emeritus of Economics, Yale University; Lamar Fleming, Jr., president, Anderson, Clayton & Co.; Pierre F. Goodrich, Goodrich Campbell and Warren; Laurence M. Gould, president, Carleton College; Henry Hazlitt, editor of *The Freeman;* B. E. Hutchinson, chairman finance committee, Chrysler Corporation; J. Hugh Jackson, dean of the Graduate School of Business, Stanford University; Vincent W. Lanfear, dean of the School of Business Administration, University of Pittsburgh; William Mathews, publisher, Tucson, Arizona *Daily Star;* A. C. Mattei, president, Honolulu Oil Corporation; Hughston M. McBain, chairman of the board, Marshall Field & Co.; James E. McCarthy, dean of the College of Commerce, University of Notre Dame; James A. McConnell, executive vice-president, Cooperative Grange League; Robert A. Millikan, California Institute of Technology; Ben Moreel, chairman of the board, Jones & Laughlin Steel Corp.; W. C. Mullendore, president, Southern California Edison Company; Thomas Parkinson, chairman of the board, Equitable Life Assurance Society; W. A. Paton, School of Business Administration, University of Michigan; J. Howard Pew, Sun Oil Company; Claude Robinson, president, Opinion Research Corporation; Robert B. Snowden, Horseshoe Plantation, Hughes, Arkansas; Franklyn Bliss Snyder, President Emeritus, Northwestern University; and Leo Wolman, professor of economics, Columbia University.

Perhaps the most revealing insight into the Foundation's spirit of inquiry is a handsomely framed quotation hanging over the fireplace in the Foundation's library. These words, attributed to George Washington during the Constitutional Convention, guide the writing and choice of all the Foundation's material: "If, to please the people, we offer what we ourselves disapprove, how can we afterwards defend our work? Let us raise a standard to which the wise and honest can repair. The event is in the hand of God."

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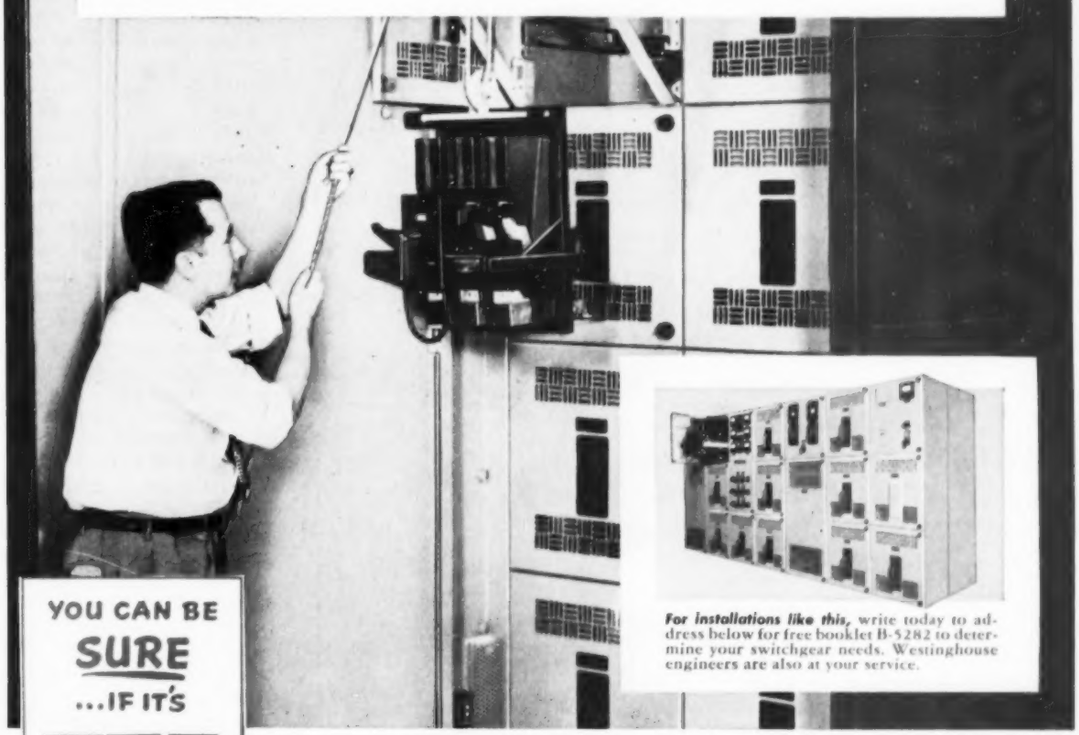

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Canadian Natural Gas

(Continued from page 59)

starts with the average market price obtainable and by deduction of distribution and transportation costs shows the average net available for purchase of gas in the field. These calculations are shown in Table II.

On the basis of its studies, the research team reached the following conclusions:

The most economic source of gas for supplying the markets of eastern Canada is the gas fields of southern Alberta.

The most economic outlet for northern Alberta (and British Columbia) gas is the Pacific Northwest.

In arriving at these conclusions, consideration was given to various possible sources of supply for consuming markets in Canada and the United States, including southern and northern Alberta, the Gulf Coast, the Texas-Oklahoma Panhandle and the San Juan Basin. The report observes that five million cubic feet of gas is now moving into Canada via Panhandle Eastern pipe line, but comments that Panhandle and Gulf Coast sources do not appear attractive for eastern Canadian markets in the quantities needed and at competitive prices. A tabulation accompanying the report shows the current price of gas in the markets intended to be served by applicant companies together with the cost of transportation and distribution, to give the average net available for the purchase of gas in the field. The tabulation shows, as between Westcoast and Pacific Northwest, that transportation cost is higher for the latter by 2.5 cents per mcf, while receipts and costs on other accounts are practically in balance. As a consequence, the margin for purchase of gas in the field becomes seven cents per thousand for Westcoast as against 4.5 cents for Pacific Northwest. This calculation does not agree with that of Pacific Northwest, which maintains that it can operate profitably on a competitive basis. Field prices for gas in northern Alberta and British Columbia are quoted as ranging from five to eight cents per mcf as compared with 12 cents for the San Juan Basin.

Both the companies seeking to supply the Washington-Oregon area report ample supplies at their command to meet present and future requirements of the territory in question. Westcoast recently amended its supply figure to show that it has available supplies of nearly 3.75 trillion cubic feet while Pacific Northwest has upped its claimed available supply to 3.6 trillion feet.

While the additions to known gas reserves in the United States year by year are much larger in volume than those of Canada, the ratio of annual consumption to total reserves likewise increases much more rapidly. A projection of this relationship into the future indicates that by 1965, demand in the United States will represent a percentage draft upon known reserves more than double that of Canada and that a decline in total known reserves in the United States will set in long before it makes itself observable in the Dominion.

While the study carried on by the research team confined itself to the economics of Canadian-United States gas supply and demand without regard to political considerations, a factor that may be taken into account by the Federal Power Commission in making its decision is the probability that gas reserves located in the Rocky Mountain region may be needed to supply sections of the country to which they can be piped more economically than would be the case in transporting them to the states of the extreme Northwest which can be served more economically or certainly no more expensively from Canada. To those who feel that the location of Canadian and United States hydrocarbon resources and the relationship between the two countries is such that these deposits should be developed to the greatest economic advantage, it appears logical that the movement of oil and gas across the border should be governed by considerations of convenience and economy rather than by any other consideration.

TABLE I

COST ESTIMATES FOR PROPOSED GAS LINES
(Comparison of Study and Company Estimates)

Pipeline	Capacity mmcf/d	Load Factor 5th Yr.—Percent Design Capacity		Transportation Costs 5th Yr. Cents Per mcf [1]		Total Capital Investment Millions of Dollars	
		Study	Company	Study	Company	Study [2]	Company
Trans-Canada Pipe Line ..	347.0	86.5	85.0	45.70	35.10[3]	304.0	280.0
Niagara Gas Transmission	112.0	60.7	53.3	4.36[4]	10.20[4]	5.3	7.1
Western Pipe Lines	264.0	92.4	77.0	14.80	17.05	76.0	71.5
Westcoast Transmission ..	310.0	80.0	89.0	28.50	24.30	160.0	152.0
Pacific Northwest Pipeline	300.0	84.0	[5]	31.00	[5]	175.0	144.0

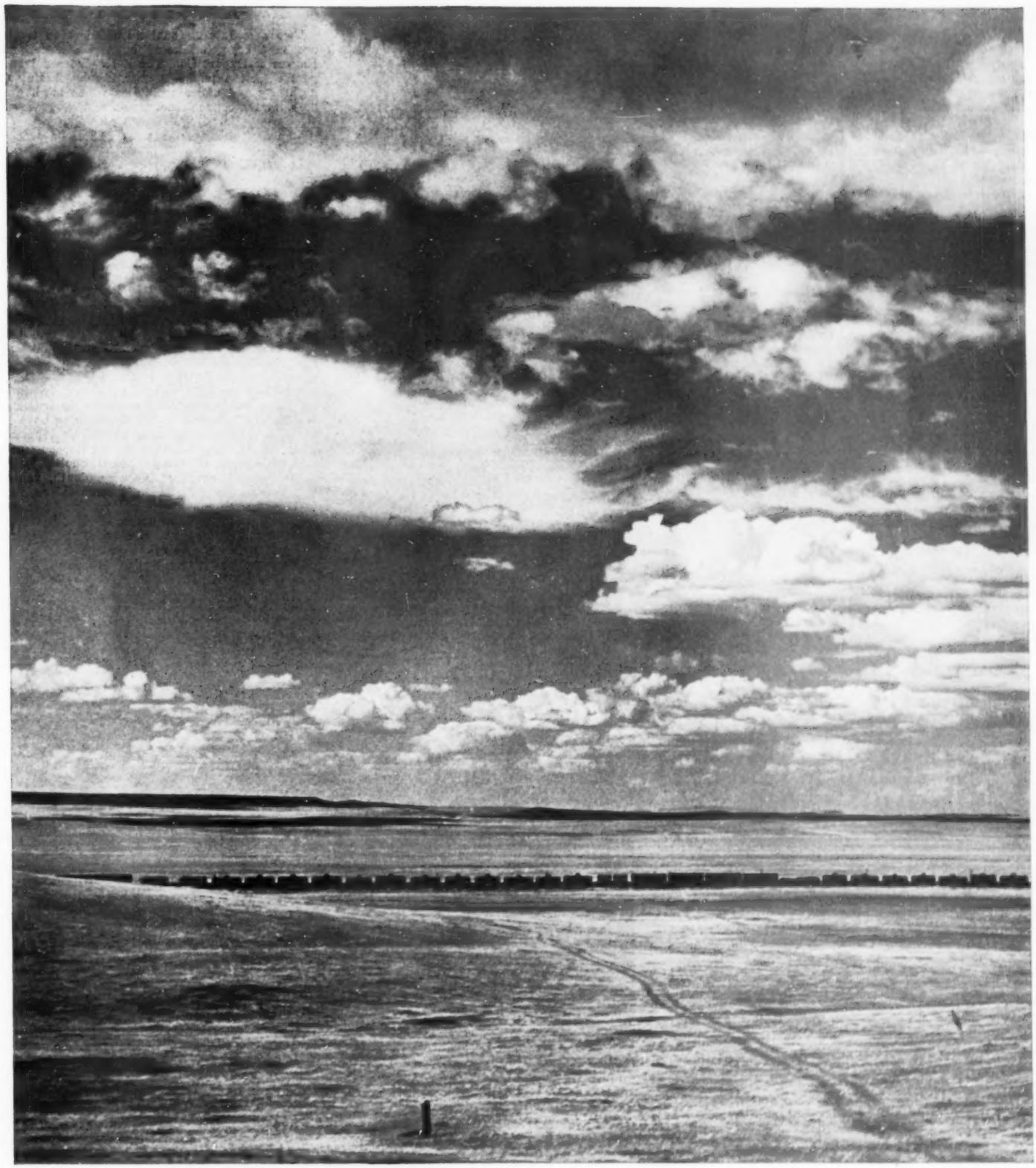
Notes: [1] Trasnportation cost as used in this study includes all operating costs, income taxes, and return on investment.
[2] Estimates of this study as of January 1943; company estimates at various dates in 1951 and 1952.
[3] Based on company estimate for third year of operation adjusted to fifth year by study.
[4] A Canadian tariff of three cents per mcf is applicable to the operation of the line.
[5] No data available for comparable capacity.

TABLE II

COMPARISON OF PIPE LINE PROPOSALS[1]

	All Canadian Route	Canadian-American Route	Trans Canada Pipe Lines Ltd.	Western Pipe Lines[2]	Niagara Gas Transmission Ltd.	Westcoast Transmission Co. Ltd.	Pacific Northwest Pipeline Corp.
Capacity Million cu. ft. per day	255	255	347	264	112	310	300
Market Demand Million cu. ft. per day	249	246	300	244	68[3]	240	250
Load Factor Percent	97.6	96.5	86.5	92.4	60.7	80.0	84.0
Average Market Price, Cents per mcf	101.0	101.0	89.5	30.5	110.0	59.5	57.5
Less Average Distribution cost, Cents per mcf	36.0	36.0	35.0	2.7[4]	40.0	24.0	22.0
Average Price Paid to Pipe Line, Cents per mcf	65.0	65.0	54.5	27.8	70.0	35.5	35.5
Less Average Transportation cost, Cents per mcf	50.5	47.7	45.7	14.8	36.6[5]	28.5	31.0
Average Net Available for Gas Purchase, Cents per mcf	14.5	17.3	8.8	13.0	33.4	7.0	4.5

Notes: [1] All estimates given in this table are those of the study.
[2] The economics of the Northern Natural Gas Co. market is not listed separately, but a demand of the magnitude of 250 million cubic feet per day is indicated. The stated value of this demand to Western Pipe Lines is 27.8 cents per mcf at the United States border.
[3] Niagara Gas Transmission Ltd. proposes to serve only the firm market in Toronto.
[4] Average utility distribution cost is calculated on the basis of estimated total gas sales including utility firm, utility interruptible and direct pipe line interruptible. The average for this line is based on 60c per mcf for the five billion sold in Canada divided by the gas sales of 89 billion cubic feet including deliveries to Northern Natural Gas for delivery to Minneapolis.
[5] This figure includes a charge of 29.2 cents per mcf for gas transportation by Tennessee Gas Transmission Co. from Texas to the international border near Buffalo for delivery to Niagara Gas Transmission. It also includes a Canadian tariff of three cents per mcf.



"The whole oil transportation network exists solely to serve the consumer. His needs are served best by many methods, competing among themselves to make all deliveries more efficient. The fact that pipelines can vie with one another, that tankers actively compete for business, that tank cars and transport trucks are working to prove their superiority to the other, means that customers are better off all around."

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Dividend to Employees

A dividend of 10 cents a share on the common stock of McCullough Tool Co. has been announced by I. J. McCullough, president. This is the second dividend paid to employee stockholders under the profit sharing and stock ownership plan inaugurated in December 1951.

Sales for the first half of 1953 totaled $4,749,000 compared with $4,179,000 in the same period last year. Net income amounted to $158,000, equal to 34 cents a share on the outstanding common stock, against $226,000, or 55 cents a share, in the like period last year.

Book Review

The World's Oilfields: The Eastern Hemisphere (Vol. VI, Part I of the series The Science of Petroleum), edited by V. C. Illing; published 1953 by Oxford University Press, New York; 174 large double-column pages; $20.

As part of the monumental work on "The Science of Petroleum" edited by Dr. A. E. Dunstan and Dr. B. T. Brooks, of which four main volumes were published several years ago, a supplemental study under the editorship of Prof. V. C. Illing has now been issued as Part I of Vol. VI.

For understandable reasons, it has not been possible to include the Soviet Union in this review, but a number of countries within the Iron Curtain are dealt with though data pertaining to these countries are mostly limited to facts known before 1945. With these limitations understood, the basic geologies of every country in Europe, Asia, Africa, or Australasia worth considering as an actual or potential producer of petroleum are brought up to date. Thirty authors, each a recognized authority on the country of which he writes, have labored to bring into this volume information on regional petroleum geology heretofore accessible only in scattered publications and records of oil companies. In this sense, it is a valuable reference work.

J. Alcorn

Cooper-Bessemer Promotes Alcorn

The promotion of John Alcorn to Cooper-Bessemer's foreign sales office has been announced by Stanley E. Johnson, vice president in charge of sales for The Cooper-Bessemer Corp., Mount Vernon, Ohio. In his new capacity, Mr. Alcorn will be assistant to M. Pollock, president of Cooper-Bessemer Overseas, Cooper-Bessemer International and Cooper-Bessemer of Canada, Ltd., with offices in New York City. During recent years he has been responsible for the application engineering of gas engine-driven and motor-driven compressors. He now will devote his efforts to the sale of engine and compressor equipment outside of the United States.

New All-Wheel Drive Trucks

Two new International all-wheel drive trucks are now being marketed by the International Harvester Export Co. The R-140-4x4 can transport three-ton payloads over rough terrain, off highways and under conditions which might immobilize the conventional truck.

New Wittich Account

Lorum Fibre Co., Inc., New York, has appointed the Val R. Wittich Organization as export representatives for "Leather Fibre," a drilling fluid additive for combatting lost circulation. A comparatively recent development, over 2 million pounds of "Leather Fibre" were sold in the United States in 1952. Fred J. Jobst, sales engineer, and Clay H. Hesse, sales assistant, will handle the account in cooperation with Mr. Wittich.

Book Review

The Instrument Manual, edited by J. T. Miller, published 1953 by United Trade Press, Ltd., London, EC4, England. Second revised and enlarged edition, 733 pages 7⅛ x 9⅛, £4.4.0.

This is a very complete manual that treats of all kinds of engineering precision instruments and gauges, instruments for determining physical and mechanical properties, optical instruments and, in general, instruments for measurement and/or control of compositional quality, time, speed, weight, pressure, vacuum, depth, volume and specific gravity of liquids, temperature, fluid flow, hydrogen ion concentration, humidity and dew point; automatic controls; electrical measuring instruments; general electronic, aeronautical, navigational, meteorological and surveying instruments; measurement of electrical conductivity; telemeters; viscosimeter; and nucleonic instruments. Each type is clearly described and illustrated. Very full bibliographies are included. This book is a handy one to have around for any sort of process control.

AT NEW YORK

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BRITISH OIL NEWS

By E. Lawson Lomax

The news event of top interest to members of the oil industry during the past month has been the change of regime in Persia culminating in the fall from power in that country of Dr. Mossadeq. At the time of writing, little has come to light about the future oil policy of the new government except for the pronouncement that it will seek to establish amicable relations with foreign countries. There is, however, no sign of any intention to denationalize oil.

The pledge of the new administration to improve conditions for the Persian people implies some future effort to restore its oil industry to operation, but it is realized that under the most favorable conditions this will require time. In the present state of complete impoverishment of Iran, immediate assistance is needed and sentiment in British oil circles applauds the action of the American government in extending aid to tide Iran over the present crisis without attempting to exact terms which the government newly come to power is in no position to meet.

Should the new regime in Persia demonstrate its ability to survive and should it adopt a materialistic attitude toward its problems, there is a feeling that through the cooperation of international oil interests and of friendly governments a plan for restoring Iranian oil to some semblance of former importance may ultimately be worked out.

Crude Oil Production

The following are the Middle East crude oil production figures for July:

	PRODUCTION JULY 1953 LONG TONS	CURRENT TOTAL 1953 LONG TONS
Iraq Petroleum Co. Ltd. (Kirkuk Field)	1,992,827	12,979,489
Basrah Petroleum Co. Ltd. (Zubair Field) ..	261,388	1,718,648
Mosul Petroleum Co. Ltd. (Ain Zalah)	111,005	786,889
Qatar Petroleum Co. Ltd.	378,093	2,234,459
Kuwait Oil Co. Ltd. ...	3,652,342	24,241,930
Aramco	28,199,974 U. S. barrels.	
Kuwait Oil Co. Ltd.—3,642,342 tons (27,027,379 U. S. barrels).		

NATO Contracts for Pipe Line System

The sweeping victory of Chancellor Adenauer in the German election gives hope that the cause of European unity and the accomplishment of a continental defense program may yet be realized. NATO officials are working steadily toward this goal and it is announced that the organization has entered into a contract of management with Foster-Wheeler Corp. for the laying of 1,920 miles of pipe lines which will distribute aviation spirit to ground forces and air bases in western Europe. As a whole it is one of the largest pipe line jobs ever undertaken.

It is part of the NATO program for the building of more than 130 airfields, stretching from northern Holland to the French Swiss Alps, to cost over one billion dollars. Centrally situated tank farms will be built connected with the eight to 10 inch U. S. Army line from St. Nazaire to Metz, and with air bases or forward areas by buried pipe lines.

Foster-Wheeler Francaise will plan and push the construction of the network, while each country will route and carry out the construction of lines in its territory under the supervision of the company. The cost of the transportation network is estimated to be $100 million, of which the United States will provide 40 percent and NATO countries the balance. Work is planned to start in the fall of 1953 and to be completed in two summers.

Tanker News

Messrs. William Hamilton & Co. Ltd., Port Glasgow, announce that the 16,500 dwt diesel tanker "Alva Bay," built for the Alva Steamships Co., Ltd., was successfully launched in August, the ceremony being performed by Mrs. Gillespie, wife of R. Gillespie, managing director of the British Tanker Co. On completion, the vessel will be chartered to the Anglo-Iranian Oil Co. Ltd.

The Blythswood Shipbuilding Co. announces that the 16,000 dwt motor tanker "Border Keep" was successfully launched from their Scotstoun yards on August 12, the launching ceremony being performed by Mrs. Mackay, wife of Major G. S. Mackay of the Anglo-Iranian Oil Co.

The vessel was built for Lowland Tanker Co., a company formed jointly in 1951 by Anglo-Iranian, Common Bros. and Matheson & Co. The company has one tanker in service, and his nine others building or on order, the whole number being due for completion in 1955.

Messrs. Harland & Wolff Ltd. announce that the motor tanker "Jarena" of 18,500 dwt., which is being built to the order of Andres Jahre and Co. of Saudefjord, Norway, was successfully launched at Belfast on August 25, the naming ceremony being performed by Mrs. Storm Nilsen. The vessel is one of a group of five ordered from Harland & Wolff by the same owners.

Sulfur Recovery at Fawley

The new sulfur recovery plant at the Fawley refinery of Esso Petroleum Co. Ltd. is now in full operation, producing 40 tons of 99.5 percent purity sulfur daily.

During the refining and cracking of Middle East oil, gas with an appreciable amount of sulfuretted hydrogen is produced. It is necessary to remove the H_2S before further operations, after which it is used to produce elemental sulfur. H_2S is removed by washing with diethanolamine solution (DEA). The solution is then boiled to liberate almost pure H_2S gas and is then used again to absorb more H_2S. The H_2S produced is then burned with a controlled amount of air as follows: $2H_2S + O_2 = 2H_2O + S_2$, and the resulting sulfur is scrubbed out of the gas by liquid sulfur. The liquid sulfur is run into tanks for solidification and is then broken to rock sulfur or ground.

Anglo-Iranian's Continental Refineries

Work will commence shortly on the erection of a Platformer unit with a capacity of 250,000 tons per year at Lavera refinery, owned by Anglo-Iranian's French associate, Societe Generale des Huiles de Petrole B.P.

This Platformer was originally planned for installation at the Dunkirk refinery of the same company, but the location has been changed to Lavera, where access to Mediterranean markets is easier. The unit is a twin to that being built at Anglo-Iranian's N.P. refinery at Hamburg, where a 1,250,000 ton *per annum* new distillation plant is being erected.

At Antwerp refinery, jointly owned by Anglo-Iranian and Petrofina, a catalytic cracking plant and a catalytic polymerization unit are in course of erection.

A new furfural solvent refining unit is being erected at the Schindler refinery, which is the Anglo-Iranian N.P. lube plant in Germany.

D'Arcy Company's Exploration

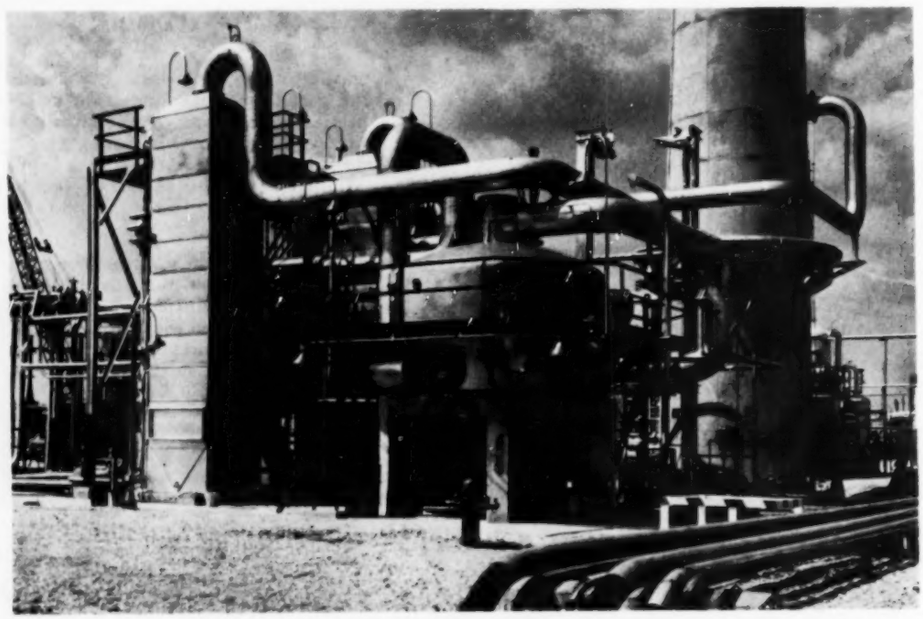
Following a long and costly period of prospecting, the D'Arcy Exploration Co. has begun the drilling of a test well at Vittoria in southern Sicily, where it has a concession area. Drilling will be carried out by Italian contractors with a rig capable of reaching a depth of 8,000 to 10,000 feet.

The company has begun drilling another exploratory well in its search for oil in the Nottingham area of the United Kingdom. This well is located at Plungar, about 23 miles southeast of the Eakring area where the company has been obtaining production for some years. A final depth of about 3,500 feet is planned for the well.

A second test well is being drilled at West Drayton, near Tuxford, and has reached over 2,500 feet.

Work on the exploratory well at Screveton, south of Newark, has been stopped after reaching a depth of 3,621 feet without finding oil in exploitable quantity.

Anglo-Iranian Oil Co. Ltd. has reprinted its booklet, "Petroleum in England" which describes its search for and development of oil resources in England. The booklet has been revised up to June 1953.



View of the sulfur recovery plant at Esso's Fawley refinery which produces forty tons of 99.5 percent pure sulfur daily from hydrogen sulfide gas generated in the fluid catalytic cracking process.

Great newcomer to a great fleet

ANOTHER SUPER-TANKER glides down the slipway—one of thirteen 32,000 ton giants ordered by the British Tanker Company, shipping organisation of Anglo-Iranian. She will join one of the largest privately-owned fleets in the world. B.T.C. owns some one hundred and fifty tankers totalling nearly two million deadweight tons and has on order or under construction in the United Kingdom more than twenty other tankers.

These great ships will carry the ever-increasing flow of oil produced by Anglo-Iranian. They will serve refineries in seven countries. They will distribute the products of this oil all over the world—from Iceland to New Zealand. Anglo-Iranian with its subsidiary and associated companies is one of the major units in the world petroleum industry. And one of the most progressive.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company LIMITED

REPRESENTATIVE IN U.S.A.: A.E.C. DRAKE, 610 FIFTH AVENUE, NEW YORK 20, N.Y.

Progress at Aden Refinery

In the past nine months, since work began at Aden in November, over 350 ships from Great Britain, America and Europe have discharged cargo of all types for construction work. More than 80,000 tons, about one-third of the final total, have been shipped in. Nearly 200 tons of urgently needed materials and perishable food stuffs have been carried in by air.

The labor staff is at present more than 10,000, including 1,500 American and British technicians, and this will increase to about 14,000 at the end of the year.

IHC British Tractor

The first crawler tractor to be produced abroad by International Harvester, a 31.3 drawbar horsepower model designated as the BTD-6 and BT-6, has recently been announced by the firm's subsidiary in England, the International Harvester Co. of Great Britain Ltd. Volume production will be underway by the close of 1953 at the expanding Doncaster, England, factory, and it is planned that eventually 2,500 to 3,000 units will be manufactured annually. It will be available either as a diesel tractor or with the distillate-burning engine.

From the Arctic to the Tropics-

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Improvements in Drilling Rigs

A mobile drilling rig has been supplied by National Supply Co. to the order of United Overseas Petroleum Co. Ltd. on behalf of the California Texas Oil Co. for the Bahrain oil fields. It is normally rated for drilling to a depth of 2,000-4,000 feet and for servicing wells to a depth of 8,000 feet. An outstanding feature of the rig is the two-section telescopic mast, supplied by Woodfield, Rochester.

Its weight is 18.5 tons and its extended length 103 feet. During transit the mast is carried on a trailer in a collapsed condition. When in use on site it is raised to a vertical position by means of two 3-stage telescopic rams, operated by hydraulic pumps fed from a supply tank.

To prevent corrosion and undue wear, the telescopic rams have been treated with chromium by Fescol Ltd. of London, which will ensure their being maintained at maximum efficiency under the arduous conditions of oil well drilling in a tropical climate, as erosion or corrosion is reduced to a minimum after this treatment.

Petroleum Distribution in Great Britain

Owing to changes in the handling of the oil industry in Great Britain, with the practical completion of the post-war refinery development program, alterations in the pattern of distribution have become necessary or advisable in the interest of increased efficiency and satisfaction to consumers, and the distributing branches of the industry are amplifying and perfecting their operations.

Formerly the greater part of the petroleum consumed in the country was imported in the form of refined products; now the crude itself is imported and the products are distributed from the refining centers to bulk storage plants of large capacity.

Two such storage plants have been brought into operation recently, one by Shell-Mex and B. P. Ltd., and the other by Vacuum Oil Co. Ltd.

The new bulk depot of Shell-Mex & B. P. Ltd. is situated at Pickering in North Yorkshire and was formally opened early in August by Sir William Worsley, Lord Lieutenant of North Riding, Yorkshire. It services areas within a 35-mile radius. Pickering Depot is road-fed from Hull and is the first of 15 new depots in the United Kingdom and Northern Ireland.

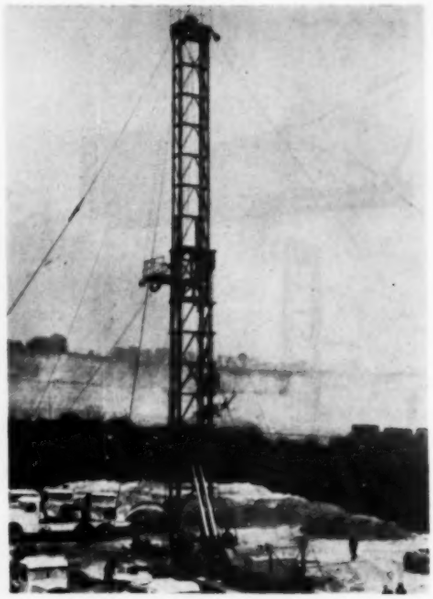
The station has storage for 340,000 gallons and consists of two vertical tanks of 86,000 gallons capacity each and 12 horizontal tanks each of 12,000 gallons capacity. The depot also contains offices for clerical staff, depot supervisor, sales representative and customs and excise officials. Products dispensed include gasoline (premier and regular grades), derv fuel, gasoil, tractor vaporizing oil, burning oil and lubricants.

In the lubricating department many grades are received and stored in packages, while others are received in bulk and packaged automatically through flow meters.

The bulk depot of the Vacuum Oil Co. is situated at Wandsworth, on the river Thames, contiguous to the existing oil blending and grease making works established in 1919.

Instead of surface tanks, this depot has a compartmented underground storage tank measuring 100 x 110 x 12 feet, with a total capacity of 650,000 gallons divided into six compartments, four of 120,000 gallons and two of 85,000 gallons each, constructed by Wm. Neill & Sons (St. Helens) Ltd. The tank is built on a concrete base three feet thick, with side and end concrete walls six feet thick. Immediately on top of the tank is a foot of reinforced concrete, two feet of hardcore and one foot of reinforced concrete slab. With this construction the loading terminal is placed on top of the tank, which is strong enough to support the heaviest road tank wagons. This is the only underground tank in Great Britain which is constructed to allow for this form of operation. By means of pneumatic hydraulic control of the pumping, a single operator on top of the vehicle can control the filling procedure.

Bulk supplies for the terminal are delivered by 75,000-gallon barges direct by river from the refinery at Coryton.



National mobile drilling rig with telescopic mast extended.

British Equipment Sales

The Council of British Manufacturers of Petroleum Equipment has published its statement of the value of orders for materials and equipment placed in the United Kingdom by oil companies during Period 2 (April-June) 1953.

The report shows a decrease of nearly £6 million ($16,800,000) as compared with the similar period in 1952, i.e., £22,461,000 ($62,891,300). The decline is attributed largely to the fact that the oil industry has caught up, to a certain extent, on its intensive post-war program.

Geophysical and other exploratory equipment	£ 3,800
Specialized equipment for oil drilling and production including casing, tubing, etc.	1,714,800
Specialized equipment for refineries (not including pumps and valves).	1,711,200
Drum and can-making, filling and cleaning equipment, curbside pumps, metering and dispensing equipment.	201,000
Railcars, road tankers, aircraft refuelers, etc.	110,800
Drums, drumsheets and tinplate	887,000
Tankage (including tank fittings)	271,000
Tubulars, pipe fittings and valves (ferrous and non-ferrous)	1,972,200
Pumps (excluding slush, oil well and curbside)	268,200
Boilers, boiler house plant and accessories, etc.	191,900
Electrical equipment, motors, generators, transformers	1,077,600
Instruments, meters and gauges	180,800
Prime movers and compressors	342,200
Machine and hand tools, welding and miscellaneous machinery and stores	1,366,200
Ferrous and non-ferrous plants, sections, sheets and bars	678,100
Automotive equipment, all types	939,600
Laboratory equipment and chemicals, hospital and medical supplies	132,600
Bulk chemicals, catalysts, barites	2,757,700
Cement and other building materials and hardware, including timber	672,300
Commissary, general requisites for office, warehouse, household, club and sports	986,200
(TOTAL)	£16,466,100 ($46,106,000)

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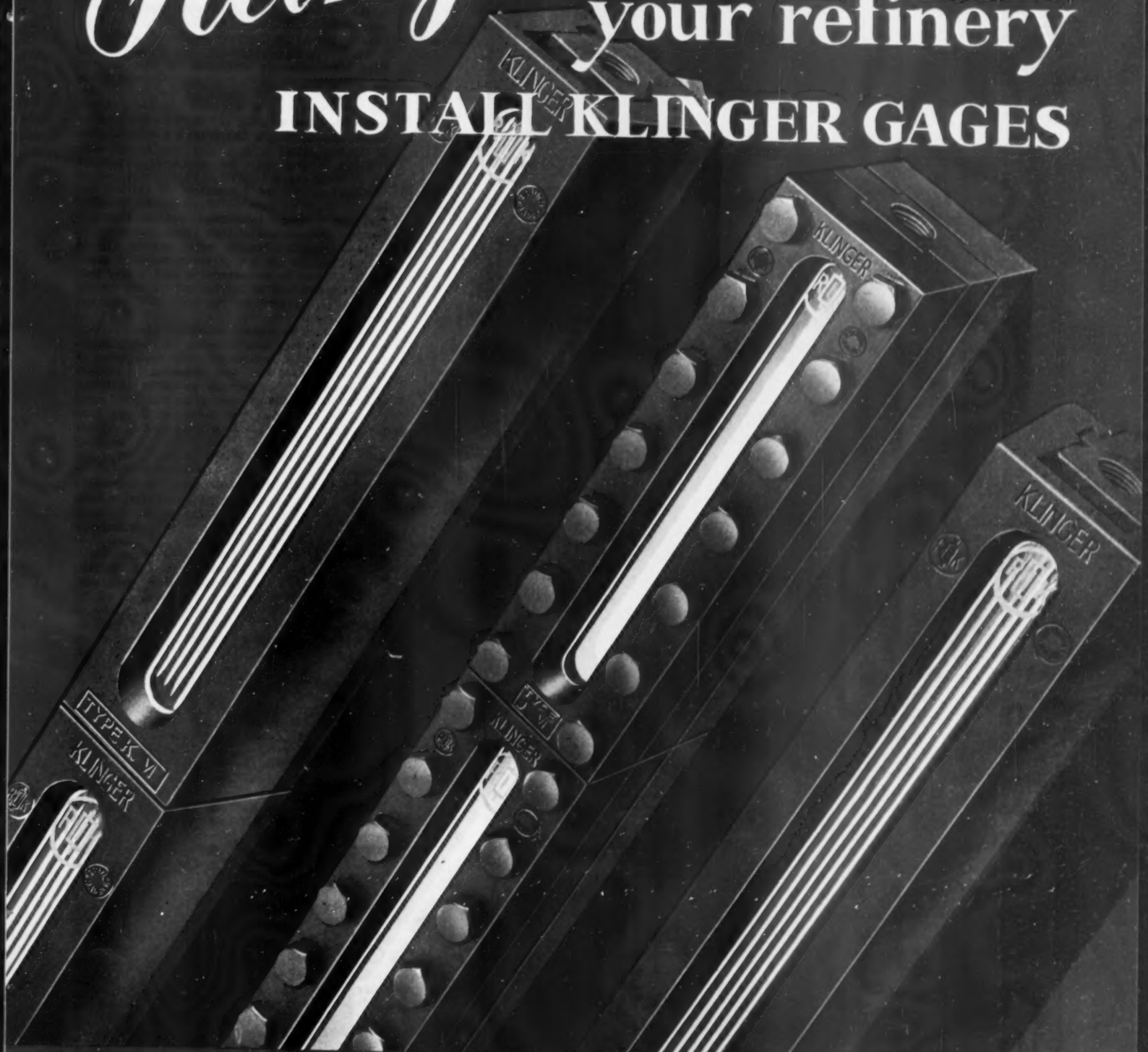

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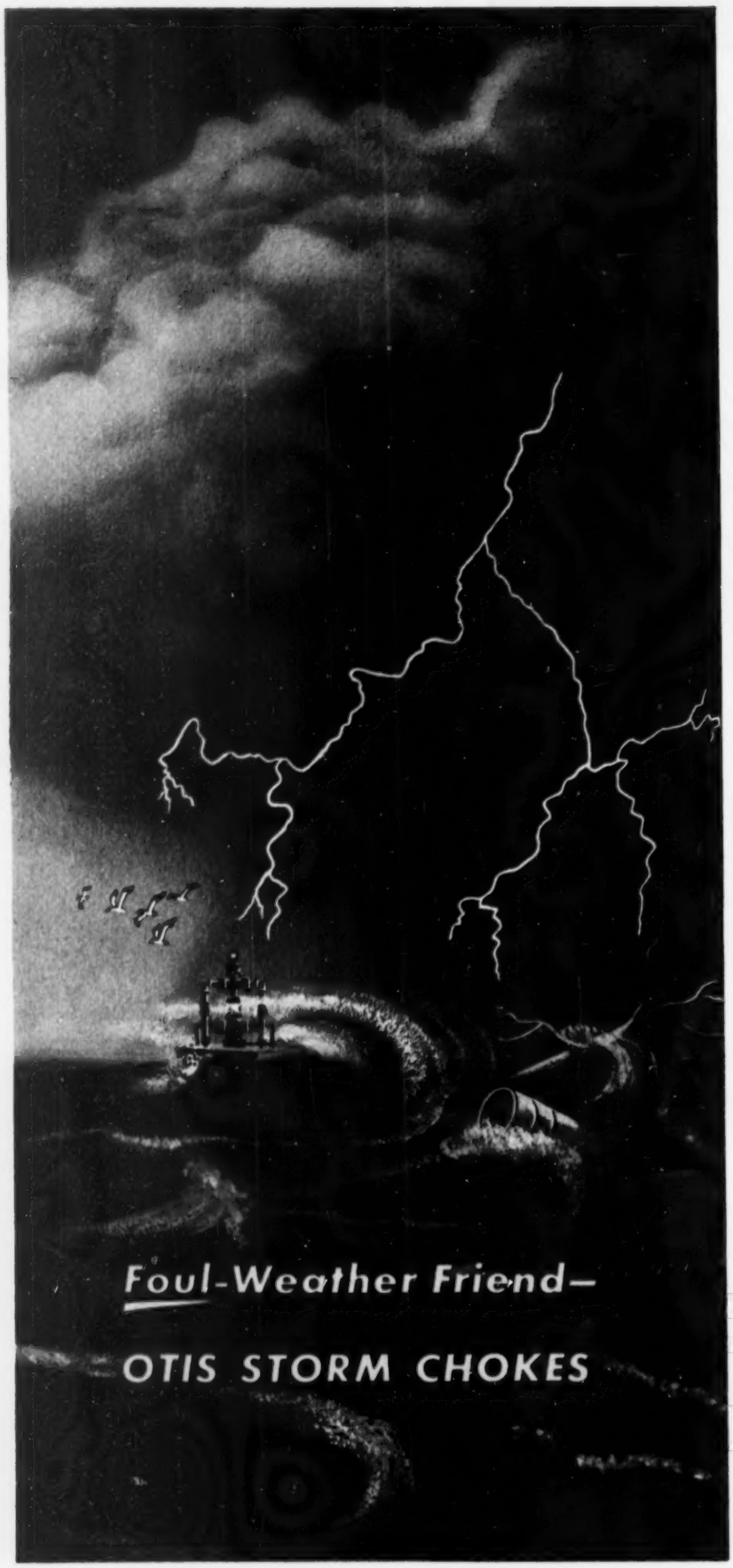


Ultrasonic Testing Techniques

Development of ultrasonic testing of metal materials and finished equipment has attracted much interest of late among metallurgists and manufacturers in Britain and the United States. Its importance derives from the fact that the petroleum and petrochemical industries are probably among the largest users of steel plate and vessels of all kinds fabricated from steel plates by welding, which have to stand up to varied pressure and temperature conditions. The inspection of plates and vessels, as well as that of the welding, by non-destructive methods, is of paramount importance if failures in use, such as have happened in the past, are to be avoided.

While destructive testing and X-ray testing have been generally employed for this purpose for a number of years, neither of these methods has been wholly satisfactory, as destructive testing usually applied to a special test piece cannot insure that the whole of the work on the product under manufacture is of the same quality as that of the test piece.

X-ray testing calls for expensive apparatus which is not easily handled on outside work where a large amount of fabrication is carried out on site, such as tank building, column building and pipe welding. In addition, it takes time and requires the services of high grade personnel.

Non-destructive testing which can be carried out on site, by the aid of easily portable apparatus, and can be mechanized in such a way that the procedure can be carried out by any intelligent person trained for the work is a very desirable target.

Ultrasonics as applied to welded pressure vessel inspection has been receiving increasing attention in the past few years. The application of ultrasonic waves for flaw detection in metals was mentioned in a German patent in 1931, but present day methods working on the echo pulse reflection principle were developed about 1942 when Sproule, investigating the detection of hair line cracks in billets, and Firestone, working independently in the United States, evolved the method in preference to the older Pohlman or shadow method. This method at the time could be applied to the testing of plates for various defects, but it was not until the development of the Perspex probe about 1948, making possible the use of shallow angle beams, that ultrasonics could be applied to the inspection of buttwelds.

The firm of W. J. Fraser & Co. Ltd., Dagenham and Barnsley, England, has carried on considerable research work in this method of inspection of raw plates and fabricated articles in conjunction with W. S. Atkins & Partners, designers of ultrasonic apparatus for this purpose, R. Eagon & Co. Ltd., makers of the apparatus, and Kelvin Hughes—Glass Developments.

A full description of the methods used for the ultrasonic detection of flaws in plates or welds is beyond the scope of this short notice, as the examination of any particular plate or weld requires its own technique; however, in general, the detection of flaws due to any cause depends on the deflection of an echo pulse from the path it would have normally taken should there be no obstruction to the emitted sound impulse.

The method, although not yet fully mechanized and standardized, is capable of detecting laminations in plates, rolled-in instrusions, porosity and welding faults and hair cracks. It is also useful in the detection of lack of bonding in clad plates.

Most codes of practice do not, as yet, officially recognize the use of ultrasonics for weld and plate inspection. It relies on the integrity and skill of the operator and is therefore an applied art. Secondly, the maintenance of constant and reliable surface contact of the Perspex probe is difficult. There is, however, no doubt that it is only a matter of research and time before these difficulties are overcome, and in that event a new and valuable method of inspection will be available.

Valve Circular

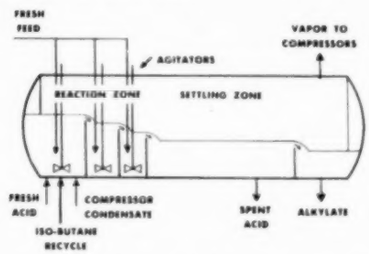
The Lunkenheimer Co. of Cincinnati, Ohio, has published two completely illustrated circulars graphically describing its line of 150 and 200 pound S.P. bronze gate valves.

REFINERY PROCESS NEWS

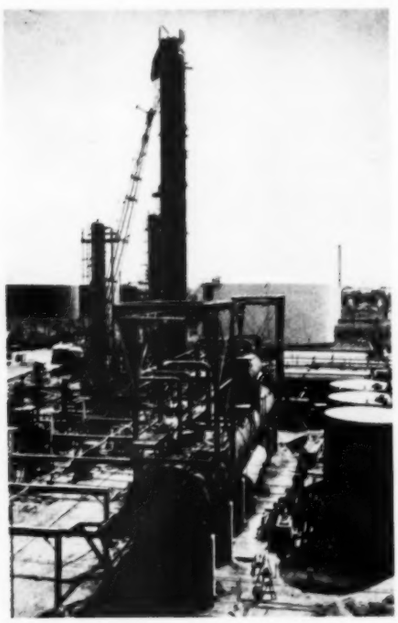
PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY OCTOBER 1953

Another Alkylation Plant Well Underway

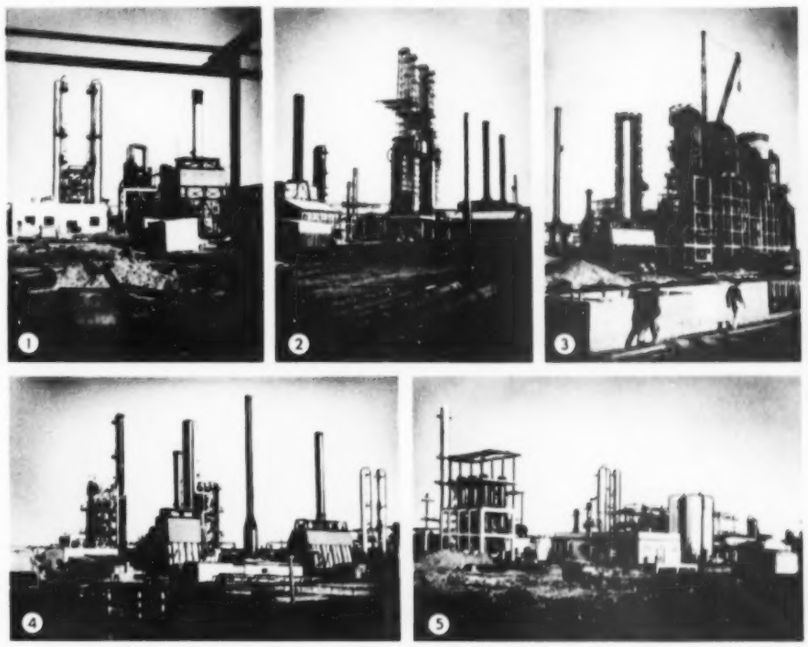
One of six Kellogg-designed alkylation units now in engineering or under construction, this one (see below) for a major East Coast refiner includes, as do the others, the unique Kellogg cascade reactor system, which has consistently produced the highest yield octane ratios at a minimum consumption of sulfuric acid.



Most important of the reasons for the improved efficiency of this new reactor is a design which provides for an unusually high isobutane-butylene ratio in the reaction phase. The reaction progresses most satisfactorily when the ratio is considerably in excess of the theoretical 4-1 ratio; Kellogg's design provides a 9-1 ratio without an increase in pumping or vessel costs.



Shown in the foreground is the Kellogg alkylation reactor. Large tower in the rear is the main isobutane-alkylate fractionator. The drums to the right are for sulfuric acid storage.



New Argentine Refinery Reflects Spread of U. S. Refining Techniques Abroad

One of six complete refineries now underway by Kellogg outside North America, this complete catalytic refinery for Yacimientos Petroliferos Fiscales in Argentina is indicative of the spread of modern U. S. refining techniques to countries which have been largely dependent upon imports to supply their needs for finished petroleum products. When on stream the new plant will have helped increase that country's domestic sources of refined oil by more than 30%.

It will be South America's most modern refinery in that it will contain most of the major catalytic processes currently employed to meet the high octane demands of the U. S. market.

Shown in the photographs are units for carrying out the eight principal processing steps to be included: (1) straight-run gasoline fractionation and vacuum distillation, (2) thermal cracking and delayed coking, (3) fluid catalytic cracking, (4) crude distillation, (5) catalytic polymerization and sulfuric acid alkylation. Not shown are product-treating units and the powerhouse.

Two indigenous crudes, Challaco and Comodoro Rivadaria, in a ratio of 25% to 75% respectively, will be charged to the refinery. Major final products will include nearly 2,500 BPD of aviation gasoline and more than 2,000 BPD each of diesel and fuel oil. The delayed coker, in preparing clean feed stock for the Fluid Catalytic Cracking Unit, will produce more than 600 tons of high quality coke daily.

One of Several Major Refinery Jobs in S. A.

This $70,000,000 Argentine refinery is only one of several major Kellogg projects currently underway in South America. These include two complete refineries of 5,000 BPD and 10,000 BPD capacities and nitrogen fertilizer facilities, at three different locations in Brazil, and a complete 20,000 BPD refinery in Chile.

In other parts of the world Kellogg projects include a complete 24,000 BPD thermal refinery in Iraq and a 70,000 BPD catalytic refinery for Australia, which will supply about 40% of that country's current product requirements.

(SEE REVERSE SIDE)

REFINERY PROCESS NEWS

CONTINUED FROM PRECEDING PAGE

Capacity of MWK Fluid Units Now Over Million BPD

The signing of several recent contracts for new Orthoflow Fluid catalytic crackers has brought the total fresh feed capacity of Kellogg-engineered FCCU's to well over 1,100,000 barrels per day. Included in this capacity are units ranging from 2,000 BPD to 63,000 BPD at locations all over the world.

When all these plants are operating, they will produce better than seven billion gallons of high quality motor gasoline annually or enough to provide every automobile in the world with an annual supply of about 100 gallons of gasoline.

One Out of Four Gallons From Kellogg Designed Units

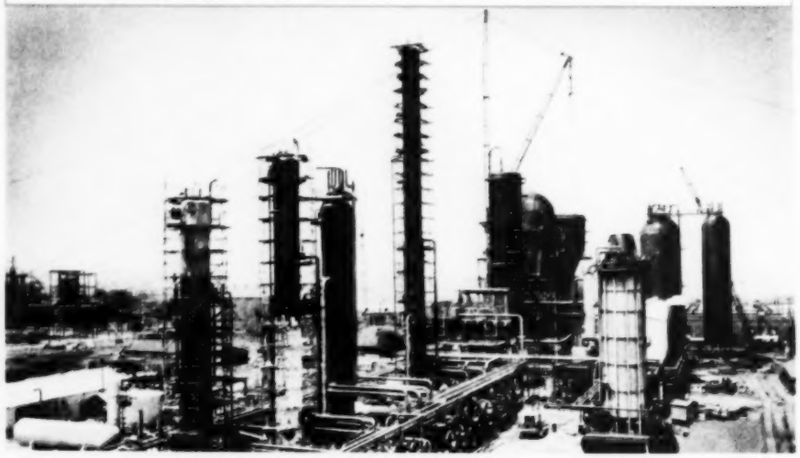
The figures above refer only to the production of Kellogg Fluid catalytic cracking units and do not include the billions of gallons of gasoline being produced by other types of Kellogg designed plants. An indication of the total gasoline making capacity of all Kellogg plants is the fact that approximately one out of every four gallons of gasoline purchased in North America comes from plants built by Kellogg.

Europe, South America and Australia Adopt Fluid Process

It is well known that Fluid catalytic cracking dominates the gasoline industry today. In fact, approximately 63% of the world's catalytic cracking capacity is of this one type.

While this process has been dominant in domestic and Canadian refining since World War II, it is now beginning to play an increasingly important part abroad, where a number of leading refiners are installing catalytic crackers. Indicative of this is the fact that Kellogg has recently completed three fluid plants in the British Isles, is about to complete one in South America, and has started construction on still another as part of a complete refinery project in Australia. In continental Europe an Orthoflow Fluid catalytic cracker has just been completed and another is currently underway.

Two Big Cat Crackers in Philadelphia



This huge (63,000 BPD) Fluid catalytic cracking unit will soon be on stream. Workmen are already installing insulation on the towers of the plant's gas recovery section. (Below) At another site in Philadelphia construction of the largest Fluid catalytic cracker (45,000 BPD reactor throughput) yet to employ Kellogg's unique Orthoflow design is progressing rapidly.

"Why's" as Important as "How's" in Manuals

Although operating manuals are not as dramatic as the actual construction of a plant, properly prepared instructions on the functioning of a refining unit play a vital part in its eventual success.

This is particularly true of refineries outside the U. S. where design specialists are not always immediately available. But to do the job best, the manuals must go beyond explaining the various steps required to start up and operate a plant. They should also be a guide for understanding the overall process—not just the mechanics of running it. They should tell "why's" as well as the "how's."

The way these "why's" and "how's" are told is important. Kellogg is continuously working on the problem of condensing this material into its most convenient form without eliminating any necessary information.

For further information, technical data, etc., on any refining process, write

REFINERY PROCESS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

Also Jersey City, Los Angeles, Tulsa, Houston, Toronto, London and Paris

KELLOGG PULLMAN

McCartney Heads Clark Export Operations

Robert R. McCartney has been named eastern division manager and director of export operations for Clark Bros. Co., division of Dresser Industries Inc., Olean, N. Y. He will coordinate the activities of the New York, Boston, Washington and the new Philadelphia office, in addition to serving as director of export operations for Clark.

Robert J. Spears has been named district manager of the New York office to succeed Mr. McCartney. He formerly was New York district sales engineer.

The new Philadelphia office is in the Fox Building at 1612 Market Street, Philadelphia. Ralph C. McDonald is manager. He has been with Clark for the past four years as a sales engineer out of the New York office.

R. R. McCartney

R. J. Spears

R. C. McDonald

New Davison Chemical Sales Offices

Davison Chemical Corp. has opened three new sales offices under the direction of resident field service engineers. Each office is the center of a sales region covering several states. Representatives with their addresses are: C. E. Meginnis, 19 S. LaSalle St., Chicago; C. Victor Bolles, Lake Charles, La., and E. Kyle Ruble, Atlas Building, Columbus 15, Ohio. Territories covered by these representatives were formerly serviced out of Baltimore. A sales office was previously established in New York City, now under P. H. McLaughlin as field service engineer.

H. L. O'Brien

SEG Offices Moved

Headquarters offices of the Society of Exploration Geophysicists have been moved to the Elm Oil building at 624 South Cheyenne, Tulsa, Okla. In the past seven years the Society has grown from 1,500 to 3,500 members and now employs four people in the headquarters office. Colin Campbell is business manager. The Tulsa office serves 11 local sections of the SEG and six student geophysical societies. The society has fostered organization of the European Association of Exploration Geophysicists, Geophysical Society of Caracas, Venezuela, and the Geophysical Society of South Texas.

Bechtel Elects Three Vice Presidents

Bechtel Corp. has elected three new vice presidents, according to an announcement by S. D. Bechtel, president. In charge of domestic activities in New York, Myles C. McGough has been elected vice president and eastern division manager. A. J. Orselli, until recently manager of construction of the eastern division, transfers to the power division as vice president and assistant to senior vice president J. P. Yates.

Fred W. Meyer, for the past five years chief engineer of the refinery division, has been elected vice president. He continues in that division, reporting to vice president Eddard E. Dorresten.

Philco Announces Biggest Ad Drive

Philco Corp. has inaugurated what is believed to be the biggest fall season advertising campaign in the television and radio industry, according to John Gilligan, vice president in charge of advertising. The campaign will coincide with celebration of Philco's Silver Anniversary in the manufacture and sale of radio receivers, Mr. Gilligan said, and will include national magazines, newspapers in 200 leading markets, television and radio networks.

Graver Opens Los Angeles Office

W. M. Broxham, vice president for sales of the Graver Tank & Mfg. Co., Inc., East Chicago, Indiana, announces the opening of a sales engineering office in Los Angeles at 1250 Wilshire Boulevard. District sales manager for the Los Angeles office will be Hubbert L. O'Brien.

Mr. O'Brien served as general chairman for the ninth annual conference and exhibition of NACE in Chicago this spring, and at the annual API convention in Chicago last fall, he delivered for his sub-committee the group's report, "Evaporation from Conservation-Type Tanks—A Practical Review," as part of a symposium on evaporation loss. At the 1952 Annual Meeting of the ASME, Mr. O'Brien was presented the Pi Tau Sigma Gold Medal Award for "outstanding achievement in mechanical engineering within ten years of graduation." He is the author of a number of technical articles and the editor of "Petroleum Tankage and Transmission," published by Graver.

Book Review

Geology of the Caballo Mountains, by Vincent C. Kelly and Caswell Silver; published 1952 by University of New Mexico Press: 286 pages, with maps.

The writers present a survey of the geology and physiography of this desolate region in Central Southern New Mexico, where rocks representative of the Paleozoic as well as Cretaceous, Tertiary and Recent occur. The region contains numerous structures suitable for oil accumulation.

New ASTM Manual

The second edition of the *ASTM Manual on Measurement and Sampling of Petroleum and Petroleum Products*, dated February 1953 and issued in early June, presents the latest and most practical measurement practices that are widely used today. It was prepared by a special division of ASTM Committee D-2, the group including leading authorities in this field, headed by L. C. Burroughs. Actually, the manual comprises seven ASTM standards, but with considerable additional explanatory and descriptive material.

The book provides recognized methods of measuring and computing oil in storage tanks of various types and for getting typical samples. All except one of the methods are presented in revised form.

Two other ASTM publications, available separately, are of related interest, namely the *ASTM-IP Petroleum Measurement Tables* and the *ASTM Manual on Tank Calibration, D 1200-52 T.*

Copies of the 150-page Manual on Measurement and Sampling of Petroleum and Petroleum Products, in a heavy paper cover, can be obtained from headquarters of the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $1.50 each.

Klinger Corporation of America

The Klinger Corporation of America, an affiliate of Richard Klinger Ltd., well known international manufacturers of a wide range of industrial equipment, has established offices at 95 River St., Hoboken, N. J. President of the American company is L. O. Arringdale, who will be assisted by two senior engineers, Vincent Maxwell and Raymond Oksala.

How To Get More Oil

A new booklet, "How To Get More Oil," has been prepared by McCullough Tool Co. to describe improvements and latest results with Burrless Bullet and Glass Jet Perforators.

Copies of the booklet are available by writing to McCullough Tool Co., 5820 S. Alameda Street, Los Angeles 58, California.

M. C. McGough

A. J. Orselli

F. W. Meyer

INTERNATIONAL NEWS AND NOTES

SACOR Refinery Reopens

SACOR, Portugal's only refinery and the first established in Iberia, has been closed from April to October this year and it resumes activity with a greatly increased capacity. This partially government-owned unit has been refining 50 percent of the nation's petroleum products.

The company was formed by French, Romanian, and Portuguese interests, with local capital limited to about 30 percent. When the plant is fully operating again early next year, it will process 25,000 barrels daily. Under the Salazar regime it enjoys a virtual monopoly in the market.

A new Edeleaneau unit will enable SACOR to refine 10,000 barrels per year of kerosine and jet fuel. A cracking plant being added will process 7,000 barrels of residues daily from the topping plant. It will not be ready until March 1954, however.

SOPONATA, the Portuguese tank fleet company, is expanding its facilities by constructing an oil pier at Cabo Ruivo near Lisbon, the site of SACOR refinery. It will also haul 24,000 to 40,000 tons of butane which will be processed by SACOR each year to produce ammonia for the Portuguese fertilizer industry.

Making these improvements is in line with the national program for economic self-sufficiency. The Portuguese government tightly controls imports and exports and keeps a sharp eye on the nation's oil industry which services 100,000 automotive vehicles.

In 1952 SACOR refined 40 percent more products than in 1951, so the nation's crude oil imports were increased proportionately. Refining of motor fuel and kerosine were increased slightly less than 40 percent; distillates were increased more than this amount.

Portugal's sources of crude petroleum center in the Middle East. Last year the total imports were: Saudi Arabia, 395,000 tons; Iraq, 12,000; Persian Gulf, 10,000; Syria, 42,000; and Lebanon, 15,000 tons.

Three American oil companies operate in the country, though strictly as distributors. By law they must buy at least 50 percent of their refined products within Portugal, which means from SACOR. Since its output will be increased next year, the U. S. units will import less refined products.

Socony-Vacuum Oil Co. is the oldest of the foreign companies, having been established in Portugal in 1901. It is capitalized at 150,000,000 escudos—about $5,000,000—and has more than 1,000 outlets. Atlantic Refining Company entered Portugal in 1929 and is now capitalized at 12,000,000 escudos. It markets 100,000 barrels of products yearly.

The third American unit, Esso Standard Portugal, a subsidiary of Standard Oil Company (N. J.), entered this field in 1946. It handles about 60,000 barrels of products yearly. Portugal's most active oil distributor is British Shell.

The following table shows the imports and consumption of petroleum products in Portugal in the last two years. The figures are in 1,000 barrels of 42 gallons.

	IMPORTS		INTERIOR CONSUMPTION	
	(Thousands of barrels)			
	1951	1952	1951	1952
Aviation gasoline ..	272	270	250	266
Motor fuel	557	670	1,149	1,178
Kerosine	449	509	935	999
Distillates	1,008	1,145	983	1,139
Fuel oil	1,802	2,054	1,719	1,872
Lubricating oil	171	146	122	130
Total			6,109	6,536
Bunkers:				
Distillates			670	686
Fuel Oil			1,032	993
Total Bunkers ..			1,702	1,679
Total Interior plus Bunkers.....			7,811	8,215

Brazil Cuts Imports

Imports of crude oil and petroleum products into Brazil during the first five months of 1953 amounted to Cr. 1,323,745,000 as compared with Cr. 4,000,990,000 during the corresponding period of 1952. Imports by volume included 808,000 metric tons of gasoline, 353,050 tons of diesel oil and 864,450 tons of fuel oil, a total of 2,023,500 tons against imports of 4,700,000 tons for the same products in 1952.

Refinery Construction in Yugoslavia

The construction of Yugoslavia's Bosanski-Brod refinery will be completed this fall. The plant, built by the F. Uhde Company of Griesheim, West Germany and its affiliate, the Knapsack Company, will have two combination thermal cracking plants.

The Uhde company is also erecting an Orthoflow fluid catalytic cracking plant in cooperation with The M. W. Kellogg Co. for the Sisak refinery. When completed, the plant will have atmospheric and vacuum distillation equipment.

Netherlands Plant Produces Synthetic Catalyst

With the building of many new refineries in Europe, Asia and the Far East, demand for catalyst for use in the catalytic cracking units of these refineries is increasing rapidly. To meet these requirements, Koninklijke Zwavelzuurfabrieken Ketjen N.V. (Royal Sulphuric Acid Works, Ketjen) has entered into a licensing agreement with American Cyanamid Co. to manufacture the synthetic micro-spheroidal catalyst controlled by the latter company for distribution in Europe, Asia, Africa and Oceania. For this purpose, Ketjen has erected a modern plant in Amsterdam, Holland.

Raw material for the manufacture of the catalyst such as sodium silicate, alumina trihydrate, sulfuric acid, and anhydrous ammonia, obtainable from Ketjen's own contact units or from other well established sources in Holland, assure an ample supply to meet all requirements and are treated by fully standardized test procedures giving a product, Ketjencat, which is highly porous, having a pore volume averaging 0.766 per gram, the surface area of the pores being well over 600 square meters per gram.

Intense Activity in British Columbia

The largest oil refinery in the Pacific Northwest and first in British Columbia to have a fluid catalytic cracking unit was officially opened at Ioco on September 16 by Imperial Oil Ltd. During the construction period, the $13 million refinery continued to operate with its former process units, some of which are now being dismantled.

Ioco was British Columbia's first refinery. It was built in 1914 with a capacity of 1,000 b/d. It was expanded over the years to 12,000 barrels a day, just over half of its new capacity of 22,500 b/d.

The Vancouver area is the scene of much oil activity as the date draws near for delivery of the first Alberta crude through the new Trans Mountain pipe line.

Work is being pushed forward on the building of small-inch lines which are to distribute crude from the main stem to refineries that are under construction or in process of being enlarged along Burrard Inlet where the pipe line company's big tank farm is located.

On the south side of the inlet in Burnaby, Fluor Corp. is moving ahead with the $10 million addition to Shell's refinery facilities. Shellburn capacity will be doubled for a total of 15,000 barrels.

Standard of California in July announced a $10 million addition to its refinery at Stanovan on the south side of Burrard Inlet in Burnaby, in what is becoming known locally as "Refinery Row." Site is being cleared on additional acreage purchased by Standard and tenders will soon be called for grading.

At Kamloops, 280 miles east of Vancouver on the route to the Trans Mountain Oil Pipe Line, Royalite is building a $6 million refinery, the first refinery ever to be built in the interior of British Columbia. Site of the 5,000 barrel refinery has been cleared and it is expected to be on stream the first of next year.

In addition to British Columbia refineries, the pipe line will serve new refineries being built in the neighboring state of Washington. General Petroleum's new 35,000 barrel refinery at Ferndale will draw crude from a branch line of Trans Mountain which will cross the international boundary near Sumas. Work has already started on the Ferndale project, while Shell Oil Co. has announced a new refinery on the outskirts of Anacortes which will take Alberta crude from the pipe line.

Royal Sulfuric Acid Works, Ketjen, Amsterdam, Holland, manufacturers of micro-spheroidal synthetic catalyst under license from American Cyanamid Co. to supply markets in the Eastern Hemisphere.

The Greatest Gasoline Development in 31 Years

TCP*, a Shell discovered additive now blended into Shell Premium Gasoline, sets the pace for the fuels of tomorrow. It's another milestone in Shell's petroleum research.

The long-recognized problem of power loss due to combustion by-products has been solved by Shell research. No longer need these by-products cause the waste of fuel and power associated with missing spark plugs and with pre-ignition.

Shell research has discovered and developed a fuel additive now in Shell Premium Gasoline—called TCP. This additive actually changes the character of harmful deposits *within the engine* so that faulty spark plug operation and pre-ignition are eliminated promptly—often during the second tankful. Old *and* new engines benefit alike.

Shell TCP additive was originally developed for aviation fuels. Up until now it has been restricted to military planes. Without question it is the greatest fuel development since the introduction of tetraethyl lead in 1922.

Important as TCP additive is for cars today, perhaps the greatest significance is its great promise for the future. TCP additive points the way to lighter, more powerful engines—engines with much greater design efficiency than has heretofore been possible.

TCP, Shell's trademark for its remarkable additive, is another example of the progressive research that goes forward day and night in Shell laboratories. It is evidence again that Shell research provides more and better products from petroleum.

*Patent applied for

SHELL OIL COMPANY

SHELL

Argentina Seeks U.S. Cooperation, Says O'Connor

Returning from Argentina after traveling 5,000 miles by government plane and helicopter on a survey of national resources, J. B. O'Connor, executive vice president of Dresser Industries, Inc., reported that the Argentinians favor closer trade relations with the United States.

"President Juan Peron, in two long talks I had with him, emphasized his determination to make the nation self-sufficient within a second five-year program just starting," said the widely traveled industrialist. "As a key feature of Argentina's new five-year program of economic expansion, the government will encourage American participation in the development of the country's oil and gas resources. This new policy has the full support of top government officials."

Peron discussed detailed plans with O'Connor for bringing in American companies and equipment to explore, drill, and lay oil pipe lines and conduct other mineral exploration. The North American visitor declares that, contrary to widespread opinion throughout the United States, there is no observable evidence in Argentina of terrorism or other earmarks of a police state.

"There is a great deal of misunderstanding in the United States about Argentina's policies and its prospects for growth," said Mr. O'Connor. "President Peron and his government have made great strides in improving the country's standard of living. Public housing is being pushed vigorously, food is plentiful and the country's over-all economic position is being improved.

"The recent visit of Milton Eisenhower, brother of President Dwight Eisenhower, drew praise from Peron. That trip has helped to create a favorable investment climate for American business." Mr. O'Connor said that President Peron not only spoke in glowing terms of Mr. Eisenhower's visit, but indicated that economic cooperation with the United States is a necessary step toward the success of his program.

"In central Argentina, near the Andes, are promising areas for quick returns to American investors," he added. "Details of a comprehensive program to be initiated as soon as finalized are now being worked out."

Mr. O'Connor's survey of natural resources took him from oil fields in the extreme southerly region of Terra del Fuego to the Campo Duran area in the north near the Bolivian border. President Peron's pilot, Vice Commodore Juan Carlos Villa, flew Mr. O'Connor and a group of Argentine officials, while a helicopter took them over structures and prospects in the Bolivian and Uruguayan areas.

"The people of Salta look and act like Texans," O'Connor commented, "big, good natured, friendly. In fact, Salta's windswept plains reminded me of Texas."

Accompanying O'Connor on his survey of petroleum resources were officials of the government oil company (YPF). In Buenos Aires he conferred with top government officials, including Humberto Sosa Molina, Minister of Defense; Alfredo Morales, Minister of Economic Affairs; Rafael Amundarian, Minister of Industry and Commerce; Carlos Hogan, Minister of Agriculture; and Juan Siri, the head of YPF, who are all men of high caliber and fully support President Peron in this new petroleum policy.

"These men are determined to strengthen the country's economic position and to improve the status of the Argentine people," Mr. O'Connor concludes. "With its huge wealth of mineral and agricultural resources, Argentina faces a bright future. I sincerely feel that Argentina presents an outstanding opportunity for American business to participate in developing the country's resources by providing capital and technological assistance.

"In reality, the Peron program is fully in line with the desire to develop attractive trade opportunities financed by private capital in Argentina joined with private capital from the United States.

Poland Ships Fuel to Sweden

A 1953 trade agreement between Poland and Sweden has specified Polish delivery of 500,000 metric tons of fuel oil to Sweden before February 28, 1954.

J. B. O'Connor

Montreal Refining Expansion

Contract for the major portion of a $10 million expansion and modernization program at Imperial's Montreal East refinery has been let to Canadian Bechtel Ltd. of Vancouver, R. W. Dunlop, manager of the engineering division of Imperial's manufacturing department has announced. Work will commence immediately.

Expansion of the Montreal East refinery will result in a 25 percent increase in capacity, raising it by 12,000 barrels to 58,000 b/d. New equipment to be installed includes an atmospheric and vacuum distillation unit and vacuum pipe still. The refinery "cat cracker" and several other units are being enlarged.

Appointed General Manager for Sun-Canadian Pipe Line Co.

Victor C. Fairless has been appointed general manager of Sun-Canadian Pipe Line Company, Ltd. His office will be in the vicinity of Waterdown, near Hamilton, Ont. Mr. Fairless was formerly assistant division superintendent of the eastern division of Sun Pipe Line Company's product lines department at Coatesville, Pa.

Sun-Canadian Pipe Line Company, Ltd., is building an eight-inch, 200-mile products pipe line from Sarnia to Toronto. The company is owned two-thirds by Sun and one-third by Canadian Oil Companies, Ltd. Completion of the line is expected in October. Initial maximum capacity of the $6 million line will be 17,000 barrels a day with a single pumping station at Sarnia.

Sperry-Sun Opens Canadian Office

Sperry-Sun Well Surveying Co., Houston, has formed Sperry-Sun of Canada, Ltd., with offices in Calgary, Alberta, Canada. Quentin B. Marsh, who has been with Sperry-Sun since 1948, has been appointed vice-president of the Canadian subsidiary.

Q. B. Marsh

Oil Exploration in Israel

Seven companies are now engaged in exploration work in Israel. Three of these, Lapidoth-Israel Petroleum Company Ltd., Jordan Exploration Company Ltd. and Israel Prospectors Ltd., have joined forces and have moved in equipment to begin test drilling in the Dead Sea area following completion of geological surveys. A field camp has been established outside of Sidon near the southern end of the Dead Sea. Lapidoth is directing operations for the group and Kerr-McGee Oil Industries Inc. has the contract for drilling. George B. Kitchel is in charge of field work for this contracting firm and heads a crew of 20 Americans who arrived in Israel during August. Drilling equipment includes a cable tool rig and two IDECO rotaries.

The Husky Oil Company of Cody, Wyoming, is carrying out geological and geophysical exploration in the coastal area. The company is using the services of the Weizmann Institute, Rehovot, for gravity work in that area and plans to extend the survey to its licensed area in the Negev.

Louis Franklin of Houston, Texas, an independent operator and geologist, is manager of operations in Israel and has been in the country for several months accompanied by J. C. Gilbert, an engineer and geologist of the company, who is acting in an advisory capacity.

The New Continental Oil Company of Calgary, Canada, has engaged the Weizmann Institute to make a geophysical survey of the areas for which the company holds licenses. The survey party, working under Professor C. L. Pekeris, has been actively at work since July. Wayne Phares of Calgary, resident geophysicist of the company, is supervising the work of the field team. Drilling equipment capable of drilling to a depth of 15,000 feet is to be shipped from the United States in time for drilling to begin by December 1.

Pan-Israel Oil Company, Inc. and Israel Oil Licenses, Inc., two corporations recently formed in Panama, hold licenses originally issued in the names of Arie Ben Tovin and G. H. Brodie. The companies reportedly are composed of independent oil men headed by William F. Buckley of New York. The two companies are now engaged in field surveys to determine drilling locations under direction of Sidney Schafer, a consulting geophysicist of Houston, Texas, with G. H. Brodie, petroleum geologist of Denver, Colorado, acting as consultant in connection with the exploration program.

German Oil Agreement with Yemen

An agreement has been concluded between the German firm of C. Deilmann Bergbau GmbH., Bentheim, and the Viceroy of Yemen to explore and develop oil deposits in Yemen. The kingdom of Yemen will participate by 75 percent and Deilmann by 25 percent in expenditures, Deilmann to carry out all geological and geophysical investigations and operate the properties. The company has been a producer in Emsland for many years.

The contract covers nearly the entire country of Yemen, but only coastal areas will be explored immediately. Geological investigations are in progress in the Salif zone under the supervision of the German geologist Dr. Oswald Schmidt. The agreement expires after five years if no oil is found. If a commercial yield is secured, the contract continues for at least 20 years.

The kingdom of Yemen embraces about 75,000 square kilometers with a population of about five million largely engaged in agriculture.

Austrian Consumption

The number of motor vehicles increased in Austria in 1952 by 6.7 percent over 1951, but consumption of motor fuel decreased by 12 percent in the overall, and 17 percent per vehicle.

Austria was unable to use all the oil products allotted her by the Soviet Mineral Oil Administration in 1952, and imports ceased entirely during the second half of the year. This was due in part at least to the April 1952 tax rise to $22 per metric ton, and the increase of the crude oil tax surcharge to $150 per metric ton.

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OIL COMPANY STAFF CHANGES

C. B. BARRETT has been elected vice president in charge of sales of The Texas Company. He has been sales manager in the 11-state southern territory with headquarters in Houston since 1938. Mr. Barrett succeeds R. L. Saunders, who continues as a vice president and director. He has been with the company since 1927.

WILLIAM R. STOTT, a veteran petroleum products salesman and marketing executive, has been appointed deputy marketing coordinator of Standard Oil Co. (N.J.) succeeding J. W. Connolly. Mr. Connolly, who has completed almost 37 years of service with Jersey Standard, will be on special marketing assignments pending his forthcoming retirement.

Mr. Stott has served as assistant marketing coordinator in the department which deals with Jersey Standard's world-wide marketing problems since January 1952.

GEORGE L. NOBLE, JR. has been elected president of Stanwell Oil and Gas Ltd., which operates several producing wells in Alberta, Canada, and has interests in other areas in Canada and the United States. A controlling stock interest in the company was recently acquired by Blair Holdings Corp.

LIONEL V. CHARLESWORTH has been appointed an assistant comptroller of International Petroleum Co., according to an announcement by L. P. Maier, president.

Mr. Charlesworth joined International in 1926 as a junior accountant, based in Peru, South America. Since then, most of his service has been with International's field operations in Colombia and Peru. He was manager of accounting of Colombian operations from June 1944 to July 1949, and of Peruvian operations from July 1949 to January 1952, when he returned to International's executive offices in Coral Gables, Florida.

HARRY F. GLAIR, director of purchases and long-time manufacturing executive of Standard Oil Co. (Ind.), retired August 27. A director of the company since 1934, he joined Standard as a clerk in the machine shop at its Whiting, Ind., refinery 47 years ago. Mr. Glair has been director of purchases since 1951. Under his direction a new decentralized purchasing policy has been established to improve purchasing department services to sales fields and refineries. Local supplies are purchased in local areas whenever possible.

ROBERT C. GUNNESS has been elected a director of Standard Oil Co. (Ind.). He is assistant general manager of manufacturing and will continue in that position. Dr. Gunness joined the staff of Standard's research department at Whiting as a group leader in 1938. He advanced to assistant director of research in 1943, associate director in 1945, and manager of research in 1947. In 1952 he was shifted to his present executive position in the company's manufacturing department. In his research work, Dr. Gunness was a specialist in distillation and heat transfer. He is the author of many publications and several patents in those and allied fields. He contributed particularly to the development of the first hydroformer. He was also prominent in developing fluid catalytic cracking, which has marked a long step forward in manufacturing gasoline.

Dr. Gunness succeeds Harry F. Glair, who retired as a director after more than 47 years with the company and nearly 20 as a director. Although most of his career was in the manufacturing department, he shifted in 1951 to director of purchases.

C. B. Barrett

L. V. Charlesworth

R. C. Gunness

EDWARD A. JAMISON has been appointed manager of LPGas sales for Gulf Oil Corp. He will report directly to H. G. Meador, vice president in charge of divisional sales. In his new position, Mr. Jamison will be responsible for the sale of natural gasoline and other natural gas liquids to wholesale buyers, brokers, and other refiners. He will also be responsible for the development of markets and the sale of these products outside those areas assigned to the company's sales divisions. Mr. Jamison formerly was assistant to the general sales manager, special products.

H. C. KING, former controller of the Ohio Oil Co., has been elected to the newly established office of financial vice president. F. S. Slick, assistant controller, has been appointed controller succeeding Mr. King.

Mr. King was first employed by Ohio as a clerk in 1921. In 1930 he became assistant treasurer, and in 1941 was appointed controller. Mr. Slick began his permanent employment with Ohio Oil as a production accounting clerk at Findlay in 1926, and was appointed assistant controller in 1941.

A. B. JOHNSON, chief engineer of The Ohio Oil Company's pipe line department, retired Sept. 1 after a 36-year career during which he performed engineering work on every major line laid by the company in that period. C. F. Firmin, assistant chief engineer, succeeded Mr. Johnson as chief engineer. Mr. Firmin began his career with Ohio Oil in the refinery engineering department at Findlay in 1933. He advanced to assistant chief engineer in the pipe line department in 1949.

R. F. DARROW, Griffin, Ind., district production superintendent for Continental Oil Co., has been promoted to production superintendent of the Kansas division, with headquarters in Wichita. He succeeds T. C. Davis, resigned. C. M. Tarr, Griffin district petroleum engineer, has been promoted to district production superintendent succeeding Mr. Darrow.

MILTON J. FARR, who has been superintendent of the American Oil Company's marine terminal at Carteret, N. J., for the last 20 years, has been named manager of the company's terminal department with headquarters in New York. He succeeds W. E. Baker, resigned. Timothy A. Sheehan, Jr. was named superintendent of the Carteret terminal. He had been an assistant superintendent for the past 14 years.

C. L. MC ARTHUR, JR., formerly Rocky Mountain regional manager for Lion Oil Co. at Denver, has been made a special representative of the division at Dallas. He is succeeded by R. I. Williams, regional manager at Wichita, Kan. E. L. Maxwell, regional geologist at Midland, Texas, replaces Mr. Williams at Wichita.

W. M. PAGGI has been appointed to the newly created position of assistant superintendent of Sun Oil Company's Houston district. He was field superintendent of the North Markham-Bay City area and is succeeded by V. T. Evans. J. O. McPherson is district superintendent with offices in Houston.

BRAME WOMACK has been appointed Canadian manager for Sohio Petroleum Co. at Regina, Sask., to succeed John H. Moyar, resigned. Mr Womack formerly was staff geologist at Oklahoma City. He has been with Sohio for 10 years in various geological posts.

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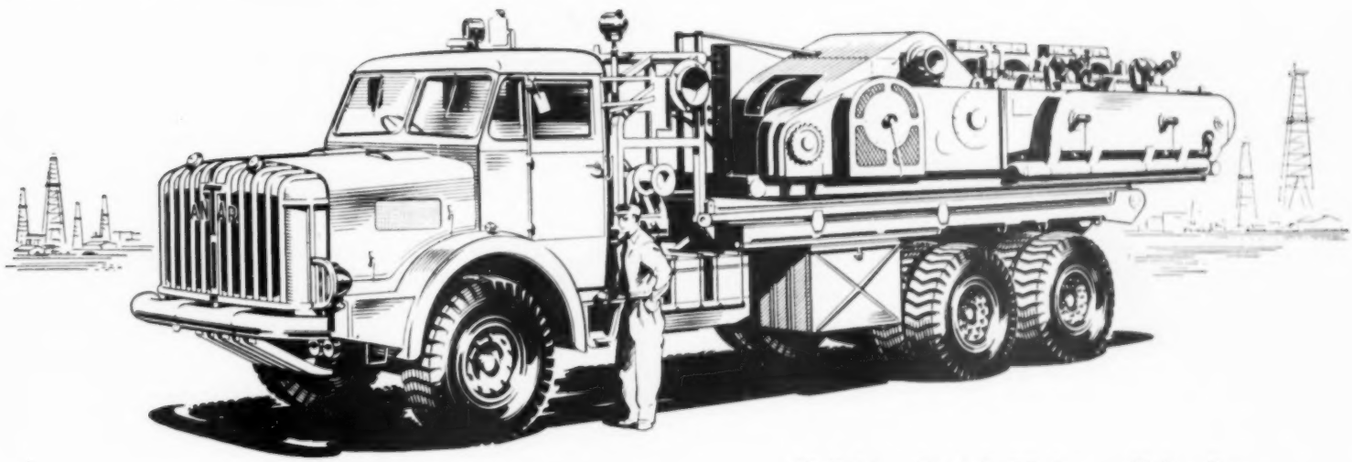

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E. B. Redpath

H. H. West

C. Z. Hardwick

E. B. REDPATH, who 48 years ago joined the Ohio Oil Company as office boy, has retired as director and executive vice president. H. H. West, secretary, has taken his place as a director and C. Z. Hardwick, formerly vice president and manager of refining and marketing, has been elected executive vice president. Mr. Hardwick became a director in 1948.

Mr. Redpath was elected secretary of the company in 1928 and has served as a director since 1932. He was elected executive vice president in 1951.

Mr. West began his career with Ohio in 1922 as a stenographer in the general office at Findlay. In 1926, after periods of experience in various departments, he became secretary to former President O. D. Donnell, who was then treasurer. In 1941 he became assistant to the president and in 1948 assistant secretary. He served in both capacities until his election as secretary in 1951.

Mr. Hardwick joined Ohio Oil in 1921 as a clerk in Haynesville, La. In 1934 he moved to the general office at Findlay, as assistant manager of the refining and marketing department, and was appointed manager and a vice president in 1945. He was elected a director in 1948.

W. B. LOGAN and **F. H. HOLMES** have been promoted to assistant general managers of the refining department of The Texas Co. T. A. Mangelsdorf, general superintendent of Texaco's Port Arthur, Texas, works since 1950, has been named manager of the operations division in New York.

Mr. Logan joined Texaco in 1922, and worked at Port Arthur, Houston, and New York before being made assistant superintendent of Texaco's Lawrenceville, Ill., works in 1934. He became superintendent in 1939. The next year he was made superintendent of Texaco's Lockport, Ill., works and in 1942 he was transferred to New York as assistant manager (operations) of the refining department. He was named manager (operations) in 1950.

Mr. Holmes began his career with Texaco as a rigger helper in 1927. Since 1932 he has held various supervisory positions at manufacturing plants at Bordeaux, France; San Antonio, Texas; and Lawrenceville, Ill. He was made superintendent of the Lockport, Ill., works in 1943, and two years later he was made general superintendent of Texaco's Port Arthur, Texas works. He became assistant manager (operations) of the refining department in New York in 1950.

Mr. Mangelsdorf was assistant professor of fuel engineering at M.I.T. when he joined the Texas Co. in 1933. He became assistant chief chemist of the Port Arthur works in 1936, and was made assistant superintendent of the Lockport works in 1942. In 1947, he became superintendent of the Lockport works. He was made general superintendent of the Port Arthur works in 1950.

Several promotions were announced in the company's research department. L. C. Kemp, Jr., director of research, has been appointed assistant to the vice president. Mr. Kemp has been succeeded as director of research by Dr. W. J. Coppoc, formerly associate director of research, and Dr. C. E. Moser has been made associate director of research. Dr. R. L. Sawyer has been advanced from supervisor of the fuels development research department to assistant director of research at Texaco's Beacon, New York, laboratories, the position formerly held by Dr. Moser.

COXEY EVANS has been transferred from the Michigan-Illinois division to Oil Hill as assistant East Kansas division superintendent for Cities Service Oil Co. to fill the vacancy left by the retirement of J. P. Murray. R. C. Cooper of Great Bend is being transferred to Olney, Ill. as assistant division superintendent of production in the Michigan-Illinois division. J. C. McClure of Great Bend, formerly assistant to Mr. Cooper, has been named assistant division superintendent of production for the West Kansas division.

D. B. Dow

D. B. DOW, Oklahoma division production superintendent for Cities Service Oil Co. (Del.), retired August 1 after 27 years with Cities Service and predecessor companies. He was with Empire Gas and Fuel for six months before his service in World War I, but at the close of the war, he joined the U. S. Bureau of Mines.

In 1926, Mr. Dow resigned from the Bureau to become gas and petroleum engineer of the Indian Territory Illuminating Oil Co. He was made chief engineer in 1929 and when ITIO discovered the Oklahoma City field, he went there to supervise oil and natural gasoline production. From 1936 until ITIO was taken over by Cities Service, Mr. Dow was assistant to the vice president in charge of production.

HERMAN G. GUNTER has been appointed vice president in charge of refining operations for the Suntide Refining Company, Corpus Christi, Texas. Mr. Gunter, a veteran of 23 years' refining experience, has served in many capacities throughout the industry.

After studying engineering at Johns Hopkins University, he joined the Standard Oil Company of New Jersey in 1930 in the chemical laboratory of the Baltimore refinery and worked up to process superintendent. He has been associated with fluid catalytic cracking, polymerization, and alkylation since they were first developed, and was in charge of a 25,000-barrel catalytic cracking unit, one of the first three built. In 1947 he joined the Carter Oil Company as assistant to the vice president, where he served until August 1952, when he became assistant general superintendent of the Continental Oil Company refinery at Ponca City, Oklahoma.

HARRIS BATEMAN, chief engineer for Cities Service Oil Co. and Cities Service Pipe Line Co., has returned to Bartlesville after completing a year's assignment with the PAD as director of its materials division. He will supervise also the purchasing, warehouse and surplus materials departments which are under the direction of C. M. Taylor and H. D. Patridge.

B. D. Leuty, who has been supervising engineering division operations as assistant chief engineer during Mr. Bateman's absence, has been appointed manager of pipe line transportation. Harry Nelson will continue as manager of Cities Service Pipe Line Co., a wholly-owned subsidiary.

JOHN H. GATCHELL has joined the staff of the Lion Oil Co. production and exploration division as a geologist. He will be attached to the central region which has headquarters at Wichita, Kansas. He has been assistant district geologist for the Atlantic Refining Co. at Wichita for five years.

PHILIP L. YOUNG was recently appointed secretary of the Standard Oil Development Co. He was formerly manager of the patent division. Mr. Young is succeeded by James K. Small, who was formeriy associate manager of the patent division.

WILLIAM F. BOONE, division engineer at Continental Oil Company's Ponca City refinery, has been promoted to resident engineer at the company's Baltimore petrochemical plant which produces raw materials for use in the manufacture of synthetic soaps.

CHARLES E. WEBBER, Sun Oil Co., Philadelphia, has been named chairman of the main technical committee of the Natural Gasoline Association of America. Vice chairman of this group is Roy Schuster, Chicago Corp., Corpus Christi, Texas.

DANIEL F. SULLIVAN, Ventura, Calif. geologist for Continental Oil Company, has been promoted to division geologist, with headquarters at Bakersfield. He succeeds E. D. Sherman, resigned.

W. B. Logan

F. H. Holmes

T. A. Mangelsdorf

hydrocarbon in EUROPE

Hydrocarbon Research, Inc., and affiliates have built or are building large scale projects for:

Gewerkschaft Deutsche Erdoel-Raffinerie, Deurag, Misburg, Germany
Union Rheinische, Braunkohlen-Kraftstoff, A. G., Wesseling, Germany
Gelsenberg Benzin Aktiengesellschaft, Gelsenkirchen, Germany
Raffineries Francais de Petrole de L'Atlantique, Donges, France
Deutsche Erdol-Aktiengesellschaft (DEA), Heide, Germany
Atlantique-Progil-Electro-Chemie, Donges, France
Sociedade Anonima Concessionaria da Refinacao de Petroleos em Portugal, Cabo Ruivo, Portugal
Societe Cherifienne des Petroles, Petitjean, Morocco (Africa)

HYDROCARBON RESEARCH, INC.
115 Broadway, New York 6, N. Y.
Cable: Hydrocol

HRI
petroleum and chemical processing for profit

TRENTON, NEW JERSEY—Hydrocarbon Research, Inc., Development Laboratory, P. O. Box 1419.
PARIS, FRANCE—Hydrocarbon Engineering, S.a.r.L., 44, Avenue des Champs-Elysées, Cable: Hydrocarbon.
DUESSELDORF, GERMANY—Hydrocarbon Mineraloel, G.m.b.H., 15-17 Fuerstenwall. Cable: Hydromin.
RIO DE JANEIRO, BRAZIL—General Heitor Pedroso, Rua da Quintanda, 20, Sala 801. Cable: Bispetro.
NEW DELHI, INDIA—A. R. Palit & Company, Sujan Singh Park, Post Box 671, Cable: Palitar.

G. J. Russ

Enlarges Sales Department

The international division of U. S. Rubber Co. has amplified its sales department under the direction of L. C. Boos, divisional vice president and general manager. G. J. Russ has been named general sales manager, a new post. Other managerial appointments include A. N. Reeves, branch sales; R. J. Thomas, distributor sales; A. Eaton-Clarke, head office and government sales; W. J. Mulvihill, product departments; J. T. Kunz, sales development; and H. L. Reynolds, sales operating.

Export Packing

National Wooden Box Association has announced publication of a new brochure entitled Export Packing, prepared for American manufacturers who ship products to overseas customers. It is intended as a guide for shippers to assure safe delivery of goods through proper application of shipping containers. Manufacturers may receive a copy of the manual through their container suppliers, or from the National Wooden Box Association, Barr Building, Washington 6, D. C.

Completes New Products Line

Sinclair Pipe Line Co. has completed a 12-inch products pipe line from Houston to Port Arthur, Texas to connect with the Evangeline system now under construction from Port Arthur to Baton Rouge, La. for delivery of products to the existing Plantation pipe line. Plantation delivers through five southeastern states to Greensboro, N. C.

Dunn to Manage Peabody Sales

John Dunn, formerly in charge of burner sales for Peabody Engineering Corp., New York, has been appointed general sales manager. He will handle all sales divisions in the western hemisphere and territorial representative companies.

J. Dunn

Standard-Vacuum Buys Office Site

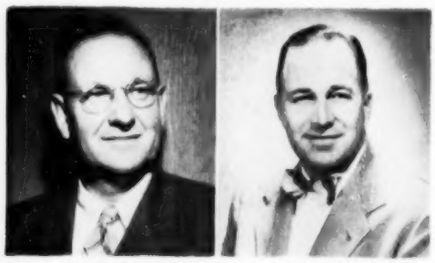
A 55-acre wooded tract in Harrison, N. Y., near White Plains, has been purchased by Standard-Vacuum Oil Co. as a site for a new headquarters office building in the United States. The company, now housed in three separate locations in downtown Manhattan, is planning the immediate construction of a suburban-type office structure, to accommodate approximately 700 persons, which is to be ready for occupancy early in 1955. The proposed structure will be situated on a knoll approximately 90 feet above street level and will occupy a gross area of 250,000 square feet.

Architectural plans being developed call for two main floors and full basement, all air-conditioned. There will be a large cafeteria and parking space for about 400 cars. The building will also serve as headquarters for visiting executives and trainees from the Eastern Hemisphere countries where the international Stanvac organization operates as a fully-integrated oil company.

Standard-Vacuum is now a tenant at 26 Broadway in the building owned by Socony-Vacuum Oil Company, Inc. The latter recently announced that it would move to a new building which is to be erected in the Grand Central area.

Avondale Announces New Plant

The Avondale Marine Ways, Inc., has under construction a large capacity plant and facilities for the manufacture of porcelain enamel architectural products. These will include load bearing walls, loadspan roofdecks and other products which are new to the building industry. The plant is being constructed adjacent to the main operation of the Avondale Corporation at Avondale, La.



D. M. Jones *C. E. Rose*

Promotions at Axelson

Douglas M. Jones, formerly assistant chief engineer and technical consultant, has been appointed chief engineer of Axelson Manufacturing Co., division of Pressed Steel Car Co., Inc., according to an announcement by W. W. Greenway, general manager of Axelson. Mr. Jones succeeds Glynn H. Williams, who has been advanced to a special production engineering post. The company also made two promotions in the sales department. Clayton E. Rose was made California sales manager and Dolph L. Witzel his assistant.

Davison Sales Manager on Leave

Norman E. Hathaway, sales manager of the industrial chemicals department of The Davison Chemical Corp., has been granted a six month's leave of absence by the company to serve as a director of the chemicals and rubber division of the chemical, rubber and forest products bureau in the successor agency to the National Production Authority which is being organized by the Department of Commerce. In his absence from Davison, his duties there will be assumed by David P. Barrett, assistant sales manager of the industrial chemicals department.

To Sell Plastic Pipe

H. M. McDaniel, well known in the plastics industry, has joined the sales staff of Republic Steel Corporation's pipe division, it was announced by Jay W. Owings, newly appointed pipe division sales manager. Mr. McDaniel will supervise the sale of plastic pipe and tubing, a field entered by Republic in June.

W. C. Kinder

Emsco and D/B Consolidate Sales Offices

Consolidation of the general sales office of Emsco Manufacturing Co. and its D/B division in Dallas is announced by William C. Kinder, vice president, recently appointed general sales manager. The Dallas offices are at Suite 406, Continental Building. Staff and personnel shifts will be made to implement the reorganization of the sales group.

Appointed Drake Memorial Curator

Thomas J. Garin of Oil City, former newspaperman, has been appointed curator of Drake Well Memorial Park at Titusville, Pa., succeeding Dr. Paul H. Giddens. W. C. Wenzel of Oil City, executive manager of the Pennsylvania Grade Crude Oil Association, said Mr. Garin will continue as director of information for the association in Oil City, a post in which he has served since 1944.

The museum at Drake Park, on the site of the world's first well drilled for oil, contains relics and documents of historical importance. It is a repository for everything connected with the birth of the petroleum industry. The park was created by funds raised through the American Petroleum Institute in 1933 and was presented to the Commonwealth of Pennsylvania in 1934. An outstanding attraction is an exact replica of the Drake well.

Joins Kerotest Sales

Russell H. Coe has been appointed sales representative for the Kerotest Manufacturing Co. in the northeast section of the U. S. He will handle sales to petroleum transmission and refining companies. Mr. Coe formerly was a vice-president of Pipe Line Service Corp., and more recently assisted in organizing the protective coatings division for Pittsburgh Coke & Chemical Co.

R. H. Coe

EUCLIDS SOLVE HAULING PROBLEM FOR

JOHN LAING & SON LTD.

John Laing & Son Ltd. used a fleet of EUCLID Rear-Dump Wagons on their Banias (Syria) harbour contract for the Iraq Petroleum Company.

As part of this immense undertaking, EUCLIDS hauled 12-ton rocks over 4½ miles of mountainous road with gradients of 1 in 6—*once again proving the superiority of Euclids on the toughest jobs.*

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Our new catalogue "Welded Fabrications" details our organisation and facilities. May we send you a copy?

Named Oil & Gas Property Management President

Jack A. Crichton has been named president of Oil and Gas Property Management, Inc. and vice president of Empire Trust Co., New York, with offices in the Fidelity Union Life Building, Dallas, Texas. Mr. Crichton is a past vice president and director of DeGolyer and MacNaughton, Dallas, and a past vice president and director of San Juan Oil Co.

Third Catformer on Stream

The third of a series of installations of the Atlantic Refining Company's Catforming process has started successful operation, the company has announced. The unit, a 1,000 barrel per day Catformer, is in the Husky Oil Company's refinery at Cody, Wyo. Atlantic is licensing the Catforming process to a number of other refiners.

Worthington Anounces SESC Bulletin

A new bulletin, No. W-300-B4, covering its line of SESC (standard end suction centrifugal) pumps is now being offered by Worthington Corp., Harrison, New Jersey. The line covers six types of pumps with varieties of mountings, frames, and drives.

Youngstown Appoints Yeckley

William H. Yeckley has been appointed to the new position of general manager of steel operations for The Youngstown Sheet and Tube Company. For the last three years Mr. Yeckley has been assistant to A. S. Glossbrenner with the title of assistant to the vice president in charge of operations. He has been directing steel operations in both the Youngstown and Chicago districts.

Justice Dept. Defends Tidelands Law

The Department of Justice, which for years bore the brunt of the Truman administration's battle to take the tidelands away from the coastal states and transfer them to the federal government, is moving now to protect state ownership of the same offshore lands.

On instructions of Attorney General Herbert Brownell, the department filed a motion in the federal district court of Washington seeking dismissal of a suit filed last July by the state of Arkansas. The Arkansas action attacked the validity of the submerged lands act of the past Congress, which was signed by President Eisenhower. That act gives the states title to the inner belt of submerged lands and the federal government title to the outer belt. Revenues go with the title.

The federal government is expected to win in the Arkansas case, but before the legal fight over the new tidelands legislation is ended, the government expects finer points of law to arise. Officials of Rhode Island have hired prominent attorneys to draft a suit assailing the new act, and Missouri is reported preparing to move in the courts, perhaps appealing directly to the Supreme Court.

Kuhl Advanced by PAD

Paul Kuhl is being advanced to director of the refining and natural gasoline division of the Petroleum Administration for Defense, according to recent announcement.

Mr. Kuhl, who is on leave from Esso Standard Oil Co., has been director of the foreign refining division of the agency, which is being left vacant for the time being. He also will serve as acting director of the supply and transportation division, vacant since Robert E. Nelson left to return to Standard Oil Co. (Ind.) and will be acting director of the production division, vacant since Emmett Vaughey left to return to his oil operations in Jackson, Miss.

Marcel Schlumberger

Marcel Schlumberger, co-founder with his brother of the internationally known Schlumberger Well Surveying Corp., died suddenly August 19 in France at the age of 69.

At the time of his death he was a director of the corporation. Mr. Schlumberger was last in Houston in May when the corporation formally opened its new $6,000,000 Houston headquarters for the United States and Canada.

Of an inventive nature and with a very keen mind, Mr. Schlumberger served as a special adviser to a number of French enterprises before joining his brother Conrad in 1919 to help develop electrical prospecting techniques. The electrical logging of oil wells was the outgrowth of these early studies. Evidence of the importance of the work of the Schlumberger brothers is best indicated by the awarding in 1941 of the Anthony F. Lucas gold medal by the AIME for distinguished achievement in the technique of finding and producing oil.

After his brother's death in 1936, Marcel Schlumberger became president of the corporation. He served in this capacity until after World War II, resigning in 1946 to devote more of his time and energy to research. His son, Pierre Schlumberger, became president in June 1946.

J. S. Shearer

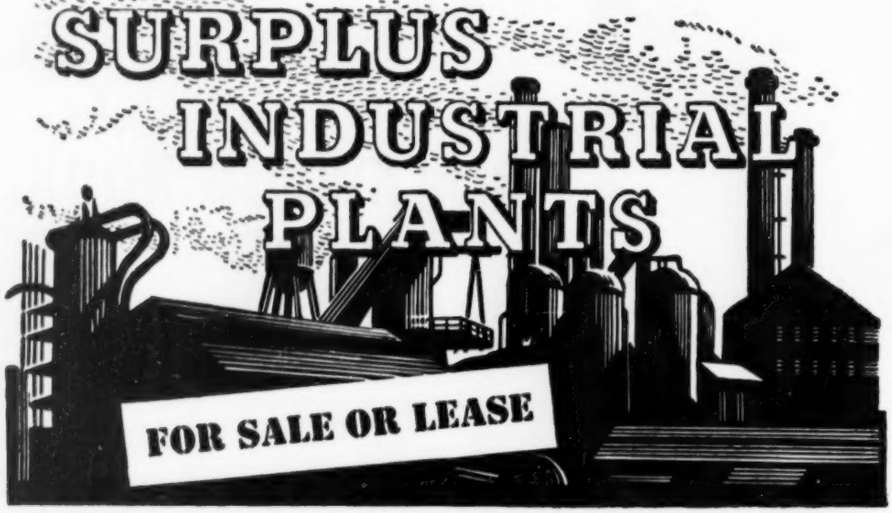
J. S. Shearer, 60, treasurer of the Southwestern Development Co., died August 25 in Englewood, N. J., after a long illness. He had been with Sinclair affiliates and predecessor companies since 1919 when he joined the Prairie Oil and Gas Co. at Independence, Kansas.

George W. Peters

George W. Peters, executive member of Pacific Petroleums Ltd. for the past three years, died August 11 after a short illness. He was assistant to the president of Pacific, and public relations officer for Westcoast Transmission Co. Ltd.

Department of the Army

SURPLUS INDUSTRIAL PLANTS



AMMONIA and LIQUID FUEL PLANTS

AT QUARTERMASTER EXPERIMENTAL FUELS STATION • LOUISIANA, MISSOURI

The Quartermaster Experimental Fuels Station (formerly Missouri Ordnance Works) is located on the west bank of the Mississippi River at a point about 2 miles southeast of the City of Louisiana, Missouri and approximately 90 miles north of St. Louis, Missouri. It comprises the following three units:

ANHYDROUS AMMONIA PLANT	COAL HYDROGENATION PLANT	GAS SYNTHESIS PLANT
Three high pressure synthetic anhydrous ammonia lines operated by *l'Aire Liquide* process with natural gas as the raw material. Capacity per month: 3150 tons of anhydrous ammonia. Anhydrous Ammonia facilities of the station constitute a part of the National Industrial Reserve and have been designated for disposal subject to the National Security Clause.	Converts coal to synthetic liquid fuel in two major operations: (1) liquid-phase hydrogenation, which accomplishes liquefaction of the coal; and (2) vapor-phase hydrogenation, which converts the liquefied coal to gasoline and by-products such as naphthalene, tetraline, benzene, cyclohexane, zylene, toluene and ethyl benzene. Throughput of 60 to 80 tons of coal provides daily output of 200 to 300 barrels of liquid fuel.	Provides facilities for the complete gasification of approximately 20 tons of coal per day to produce a carbon monoxide-hydrogen mixture which is used in the synthesis of hydrocarbon by the Fischer-Tropsch process. Capacity: 40 to 80 barrels of liquid fuels a day and, in addition, by-products.

SEALED PROPOSALS FOR THE PURCHASE OR LEASE IN WHOLE OR PART ARE BEING SOLICITED

Detailed information, arrangements for inspection and proposal forms may be obtained from the Division Engineer, Missouri River Division, Corps of Engineers, P.O. Box 1216, Omaha, Nebraska.

CORPS OF ENGINEERS U. S. ARMY WASHINGTON, D. C.

Ownership of 1952 Production

British and associated Dutch oil companies produced 96,190,000 metric tons of oil (including natural gasoline) in 1952, according to the Petroleum Information Bureau, London. The total was only some two million tons below the 1951 production, which included over 16 million tons obtained from Persian oilfields before operations were suspended in July of that year. British and Dutch companies thus increased their output in all other oil producing countries where they are concerned by a total of 14,000,000 tons.

Major sources of supply last year were Venezuela (30,590,000 tons compared with 28,980,000 tons in 1951), Kuwait (18,820,000 tons against 14,100,000 tons) and Iraq (820,000 tons as compared with 4,370,000 tons in the previous year). Other large contributions came from British Borneo (5,140,000 tons) and Indonesia (4,610,000 tons). British and Dutch interests also produced a record 16,290,000 tons in the USA.

U. S. companies were responsible for a total of 458,540,000 tons throughout the world. Other interests produced 85,650,000 tons, of which approximately two-thirds came from the USSR and eastern Europe. Details are shown in the following table.

1952 OWNERSHIP OF OIL PRODUCTION

(THOUSANDS OF METRIC TONS—INCLUDING NATURAL GASOLINE)

	British & Dutch	U. S.	Others	Total
North America				
U. S. A.	16,290	315,340	650	332,280
Canada	30	5,000	3,250	8,280
Total	16,320	320,340	3,900	340,560
Latin America				
Venezuela	30,590	63,820	480	94,890
Mexico	—	—	11,090	11,090
Colombia	2,110	1,570	1,930	5,610
Argentina	460	70	3,080	3,610
Trinidad	2,970	90	—	3,060
Peru	440	1,810	50	2,300
Others	300	80	310	690
Total	36,870	67,440	16,940	121,250
Middle East				
Saudi Arabia	—	40,390	—	40,390
Kuwait	18,820	18,820	—	37,640
Iraq	9,820	4,090	4,950	18,860
Qatar	1,560	780	960	3,300
Egypt	1,820	570	—	2,390
Bahrein	—	1,510	—	1,510
Persia[1]	—	—	1,000	1,000
Others[2]	—	—	160	160
Total	32,020	66,160	7,070	105,250
Far East				
Indonesia	4,610	3,780	—	8,390
British Borneo	5,140	—	—	5,140
Others	710	160	300	1,170
Total	10,460	3,940	300	14,700
Western Europe				
Western Germany	100	300	1,360	1,760
Netherlands	360	360	—	720
Others	60	—	580	640
Total	520	660	1,940	3,120
U.S.S.R. & Eastern Europe[3]				
Total	—	—	55,500	55,500
WORLD TOTAL	**96,190**	**458,540**	**85,650**	**640,380**

[1] Estimated. Actual ownership of production in dispute.
[2] Includes production in North Africa.
[3] Best available estimate. Principal source of production is the U.S.S.R. British, Dutch and American interests have concessions in Eastern Europe, but at present have no control over production.

Joins Cyanamid

Richard G. Keppler has joined American Cyanamid Company's refinery chemicals department as a technical representative in the firm's New York offices. Before joining Cyanamid, Mr. Keppler was in charge of research and development for Borne Scrymser Company, general manager of Ultra Penn Refining Co., and research chemist with the Standard Oil Development Co.

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Barret Building New Geophysical Plant

William M. Barret, Inc., consulting geophysicists of Shreveport, Louisiana, have begun construction of a new $250,000 geophysical plant in midtown Shreveport, at the corner of Dalzell Street and Linwood Avenue on a 6.4 acre tract.

Scheduled for completion before the end of the year, the new main building will house the administrative offices, laboratories and instrument shops. Automotive shops will be located in another building, and a third structure will house the paint shop and a covered parking area. Neild-Somdal-Associates, of Shreveport, are architects and engineers for the new plant, which will provide some 14,000 square feet of floor space.

Founded 26 years ago, the Barret company has pioneered in the development of the magnetic and radio methods of geophysical exploration. Recent developments include the Radoil method, a radio technique for locating oil fields, and its mining counterpart, the Radore method, for locating ore deposits. As consultants for the petroleum and mining industries, the company operates geophysical crews on a contract basis, and it also acts as licensor of some 40 patents on geophysical apparatus and methods which it controls in the United States and foreign countries.

The research, development and manufacturing activities related to the production of the specialized electronic equipment employed by Barret field crews and those of its licensees will continue to be handled by its affiliated organization, the Engineering Research Corporation, which will also be quartered in the new plant.

Detergent Alkylate Plant on Stream

Standard Oil Co. (Ind.) is now in production of detergent alkylate in a recently completed plant at its Whiting, Ind., refinery, it has been announced by A. F. Endres, refinery manager.

Artist's view of projected new Wm. M. Barret building in Shreveport, La.

Builds Products Line

Standard Oil Company (Ind.) has started construction on all sections of a new 238-mile products line from Whiting, Ind., to River Rouge, Mich. The new 10 and 12-inch line will be connected with Standard's five other products pipe lines in seven midwestern states, which total 1,731 miles in length. It will be possible to supply the line with products from the company's Sugar Creek, Mo., and Neodesha, Kan., refineries as well as from Whiting, Ind.

Rotary Bulletin

The type 205-B Multimatic Rotary, which has built-in, air-actuated slip-operating mechanism and other new features, is presented by the National Supply Company, Pittsburgh, Pa., in Bulletin 399, a 16-page illustrated brochure.

Expands Terminal

General American Transportation Corp. has acquired the James B. Berry and Sons Co., Inc. properties at Carteret, New York. This additional space and facilities will enable General American to expand its present Carteret terminal.

Petro-Chem Furnace Booklet

Petro-Chem Bulletin 53-1 has been published by Petro-Chem Development Co., 122 East 42nd Street, New York, 17 to describe isoflow radiant convection heaters. In this type of heater a circle of vertical tubes is placed in a cylindrical combustion chamber so that all are equidistant from the flame burst of floor burners. A central reradiating cone is installed at the top to increase flue gas velocity and ensure an even distribution of radiant heat.

Gadgets

A collection of 59 gadgets designed by workers in various laboratories and plants of E. I. du Pont de Nemours & Co. has been described in a booklet prepared by the company's petroleum chemicals division. Most of the gadgets are ingenious hand-made devices designed to do a job better or more safely. A few have been made commercially. Du Pont will send a copy of the booklet and detailed information about any gadget on request to Wilmington or to the nearest district office of the Petroleum Chemicals Division.

New Asphalt Plant Planned

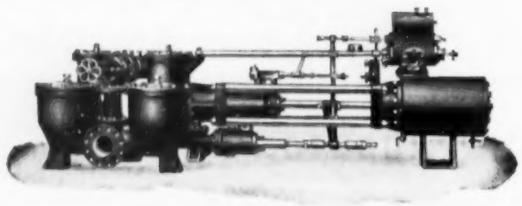
American Bitumuls and Asphalt Co. of San Francisco will build a $4 million asphalt refinery at Miami Ford, 12 miles west of Cincinnati. It will process Venezuela crude delivered by barge up the Mississippi and Ohio rivers.

The plant will include a two-stage distillation unit, an administration building and laboratory facilities.

Phillips to Build Platformer

Phillips Petroleum Company will construct a new 16,000-barrel UOP Platformer unit at its Sweeny refinery in the Gulf Coast area south of Houston. Construction, to be handled by Procon Inc., is expected to begin early next year with completion scheduled for late in 1954.

for all refinery duties



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"Hall" pumps of every type are backed by an efficient and comprehensive record system ensuring the correct and prompt supply of spares and replacements.

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PRACTICAL OIL GEOLOGY—Dorsey Hager ..... $ 8.00
PRACTICE OF LUBRICATION—T. G. Thomsen ..... $ 8.00
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Oil Field Development" ..... $ 8.50
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Oil Field Exploitation" $10.00
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Petroleum Production Economics" ..... $ 8.00
PETROLEUM REFINERY ENGINEERING—N. L. Nelson $10.00
PETROLEUM PRODUCTION (5 Volumes)—Park J. Jones
Vol. I—Mechanics of Production: Oil, Condensate and Natural Gas, 1946 ..... $ 5.00
Vol. II—The Optimum Rate of Production, 1946 ..... $ 5.00
Vol. III—Oil Production by Water, 1947 ..... $ 5.50
Vol. IV—Condensate Production and Cycling, 1948 ..... $ 5.50
Vol. V—Oil Production by Gas & Flooding, 1948 ..... $ 6.00
PRINCIPLES OF PETROLEUM GEOLOGY—Wm. L. Russell ..... $ 7.50
PRINCIPLES OF SEDIMENTATION—2nd Edition—W. H. Twenhofel ..... $ 7.00
PETROLEUM CHEMICALS INDUSTRY—Richard Frank Goldstein ..... $ 8.50
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SAFETY IN PETROLEUM REFINING & RELATED INDUSTRIES—George Armistead, Jr. $10.00
THE SCIENCE OF PETROLEUM, Vol. 5, Pt. I, Crude Oils—Benjamin T. Brooks and A. E. Dunston $11.00
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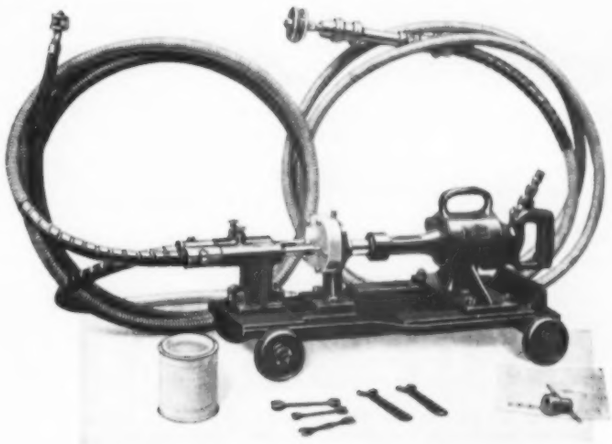

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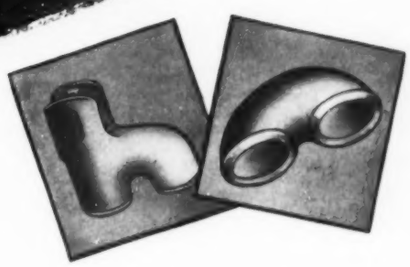

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Has one cleanout opening only opposite tube hole, so that by using on alternate end of furnace, each tube can be effectively inspected and cleaned.

TYPE W.2.
Standard Welding 180° U Bend with extra heavy outer wall to ensure longer life.

For Oil Refinery and Chemical Plant.
Made in Sheffield to the design of The Ohio Steel Foundry Co., U.S.A.

Return Bends are manufactured for all pipe sizes, any I.D. or wall thickness, from any type of cast steel, and on close centre dimensions.

OSBORN

SAMUEL OSBORN & CO., LIMITED
CLYDE STEEL WORKS, SHEFFIELD, ENGLAND.

Type 125 rig used by Ohio Oil Co in the Paloma field in drilling to record depth of 20,522 feet.

California Wildcat Sets Depth Record

News that a new world record for deep drilling had been attained created a stir of interest when announced on August 20. On that date the drilling bit of the Ohio Oil Company's wildcat well in the Paloma field of Kern County, California reached a depth of 20,522 feet. This surpassed by a single foot the record established by Superior Oil Company at Rock Springs, Wyoming in 1949.

The record thus set by the Ohio Oil Company, however, did not mark the completion of the well, which was intended to test the Eocene formation which had been estimated to lie at approximately 21,000 feet. Barring some unforeseen difficulty, it was expected that the well would be continued down to the Point of Rocks sand marking the objective point of the test.

An interesting point in the drilling of the Paloma well, officially designated as the company's KC 4 A No. 72-4, is that the work was done by a National draw-works described as Ideal Type 125, a smaller rig than that used on the previous record holder. When the well reached a depth of 20,100 feet, the swivel was replaced by the new Ideal Type N-815 shown in the accompanying photograph. Other equipment used was a 164-foot Lee C. Moore steel derrick, Superior gas engines, National mud pumps, GMC diesel, and an Oilwell torque converter.

Much of the drilling was with diamond bits, both regular and coring, which made it possible to remove solid cores of the geological formations at various depths. Hundreds of these cores have been brought to the surface and are expected to yield much geological information that will be of aid in future oil searches. Rock bits were used to penetrate the hard formations.

L. E. Ash Heads Macco Construction

L. E. Ash has been appointed general construction superintendent of the refinery division of Macco Corp. of Paramount, California. For the past six years he has been construction superintendent, engineer and project manager for Foster-Wheeler Corp. While with them he handled projects in the oil and chemical fields ranging in size up to $40 million. Mr. Ash also acted as engineering representative in England and Norway and conducted economic surveys of various types in England and Belgium.

Catalytic Reformer for Texas Plant

To complete expansion programs of Pan American Refining Corporation at its Texas City plant, a contract has been placed with the M. W. Kellogg Co. to construct a catalytic reforming unit, according to an announcement by H. William Moore, president of Pan American.

The new unit will have a capacity of 21,000 b/d using a process developed jointly with Standard Oil Co. of Indiana. Construction is scheduled to take place during 1954.

Another Refinery for Williston

Plans for a refinery of 1,500 b/d capacity to be built at or near Williston, North Dakota, have been announced by the Williston Basin Refining Company, headed by R. Mowby. Koch Engineering Company of Wichita, Kan., is the contracting engineer.

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VOKES filters for engine protection including lubricating oil filters—filtering all the oil all the time; fuel filters, protecting engines and injection equipment from damage through foreign matter in the fuel supply; engine air-intake filters which prevent the ingress of all particle sizes which would otherwise cause needless damage and depreciation.

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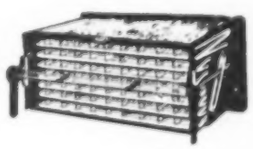
VOKES filters for air conditioning include the Microvee Dry Fabric Panel Type Air Filter for ordinary atmospheric conditions, and the famous K.600 Kompak air filter, particularly recommended where oily or sooty atmospheric conditions are encountered. These filters can be serviced with the utmost speed and simplicity.



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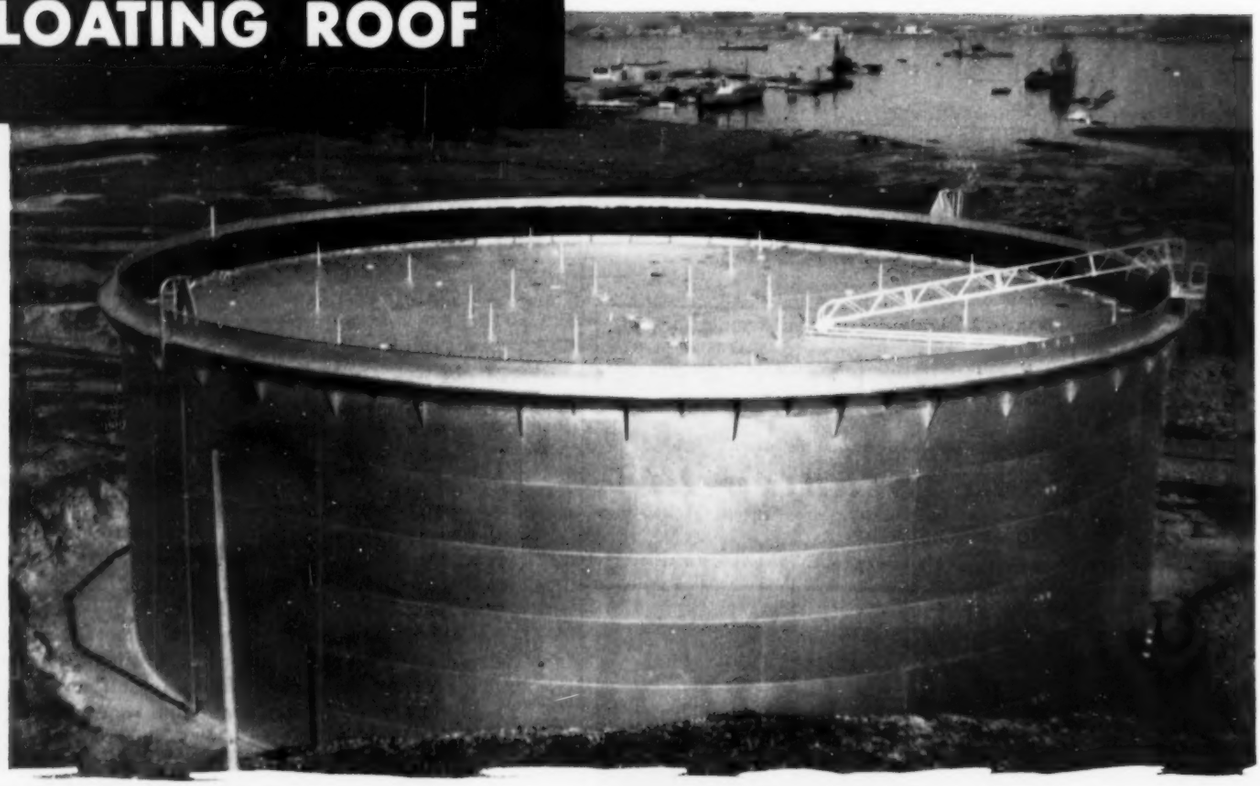
HORTON
DOUBLE-DECK FLOATING ROOF



for economical tank farm storage

Floating directly on the surface of the liquid in a tank, a Horton Double-Deck Floating Roof prevents the forming of any air-vapor mixture above the liquid that may be vented and lost. The entire bottom of the roof is normally in contact with the liquid, reducing evaporation loss, corrosion and fire hazard. Air space between the two decks provides insulation over the entire surface of the liquid.

To assure the utmost in efficiency, all Horton Floating Roofs, are equipped with the Horton Seal, a device which efficiently closes the space between the rim of the roof and the tank shell.

When planning either standing or working storage for volatile liquids, write our nearest office for information or quotations on Horton Floating Roofs. There is no obligation on your part.

HORTON STRUCTURES built for the Petroleum Industry

HORTONSPHERES . . . for the storage of highly volatile petroleum products. Built in capacities from 1,000 to 30,000 bbls. for operating pressures from 32 to 247 lbs. per sq. in.

HORTONSPHEROIDS . . . are especially well adapted for the storage of less volatile products. Built in standard sizes from 2,000 to 120,000 bbls. for 2½ to 140 lbs. per sq. in. pressure.

HEMISPHEROIDS . . . are used primarily for the storage of motor fuel, and less volatile grades of natural gasoline. Available in sizes from 2,000 to 30,000 bbls. for pressures from 2½ to 5 lbs. per sq. in.

HORTON FLOATING ROOFS . . . to reduce evaporation losses from flat-bottom tanks. Available in three types—double-deck, pontoon, and pan. The Horton Seal is standard equipment on all three roofs.

HORTONDOME ROOF . . . becomes an integral part of a tank storing a volatile liquid to provide a variable volume vapor space that will reduce evaporation loss.

HORTON VAPORSPHERE . . . is an independent vapor storage unit interconnected to fixed roof tanks storing volatile liquid and forming a vapor saving system to reduce loss.

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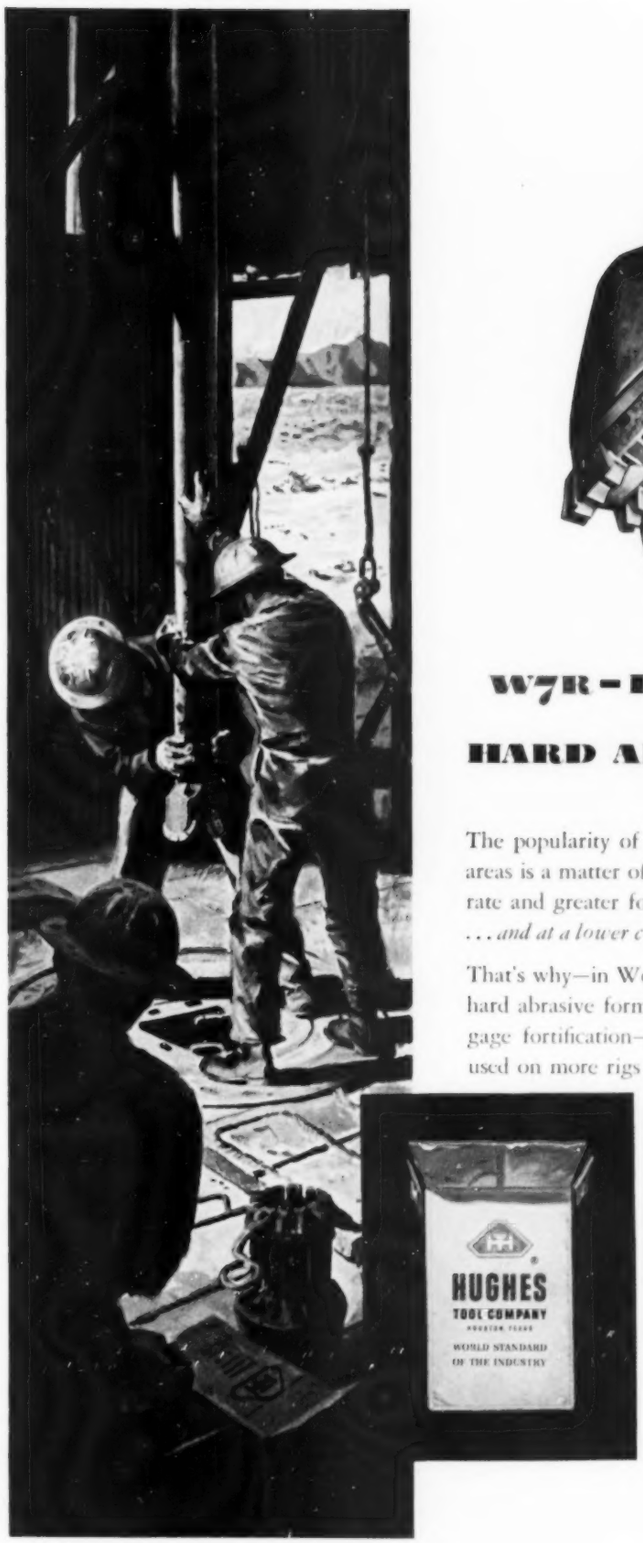

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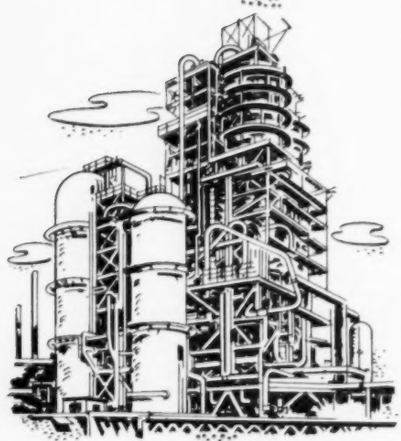
The popularity of Hughes "W7R" rock bits in hard abrasive areas is a matter of simple arithmetic. Their higher penetration rate and greater footage per bit mean more hole drilled faster *. . . and at a lower cost!*

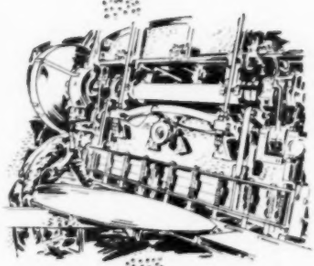
That's why—in West Texas, the mountain states, and wherever hard abrasive formations are encountered, requiring maximum gage fortification—you find more Hughes "W7R" bits being used on more rigs than all other makes combined.

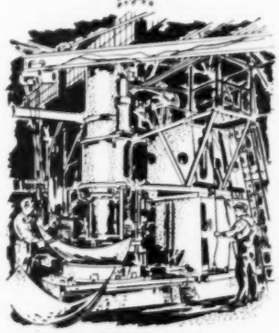
Experience gained in studying the performance of millions of bits in thousands of wells, over a period of more than 40 years, goes into every HUGHES bit.

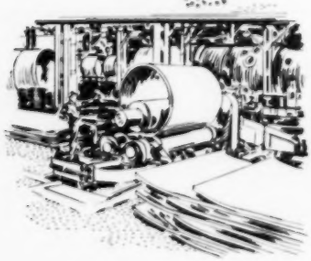
HUGHES *Tri-Cone* ROCK BITS

THE Wyatt STANDARD









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